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1961

The Maine Lobster Fishery

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In 1957, the U.S. Fish and Wildlife Service made a grant of \$25,000 to the Maine Department of Sea and Shore Fisheries in response to an application by Marine Research Director, Robert L. Dow, to undertake a joint biological and economic study of the Maine lobster fishery. With the approval of the grantor, a sub-contract was executed with the Economics Department of Bowdoin College to research the economic aspects of the fishery. Pontecorvo and Storer prepared the following document as their contribution.

THE MARKETING OF LOBSTERS

THE MAINE DEALERS

With the commercialization of the live lobster fishery in the first half of the nineteenth century, the lobster dealer rapidly emerged, distinguished by his performance of the essential functions of purchase, storage, transfer, and distribution. In large part, these functions are derived from the geographical dispersion and isolation of the lobster fishermen along the Maine coast, together with the relative concentration of consumption in the northeastern urban area that has been serviced to a very large degree through the Boston and New York markets.

In this sense, the dealer does nothing with the product itself (except to try to preserve its life until sold). Rather, he concerns himself with the purchase of the lobsters at a favorable price, storing them and eventually selling in the market under the most favorable terms he can obtain.

Reference has already been made in Chapter II to the reported arrival in 1826 of the two smacks, the Luna and the Pelee, off the shore of Bailey Island.¹

1. See Chapter II, page 2.

The appearance of these smacks from Connecticut is the first evidence of the emergence of the dealer in live lobsters along the Maine coast. Though these "alien" smacks met with some opposition from the more conservative local fishermen, the possibility of an expanded market was not wasted on most of

the younger men. Not only did they sell lobsters to the smacks, but some of the more affluent bought smacks and became dealers themselves, buying from their neighbors and shipping the lobsters to the markets in Boston and elsewhere.²

2. It is not intended to imply that prior to the arrival of the Connecticut smacks there had been no sale of lobsters. Earlier, however, the sale had been on a limited local basis.

Since its establishment early in the nineteenth century, the role of the dealer has tended to remain essentially unchanged.

A better appreciation of the role of the various lobster dealers and buyers operating in Maine can be obtained by describing, in some detail, their operations and functions.

At the bottom, in terms of their size and the scope of their operations, are the small lobster buyers carrying on their business at the ends of wharves in any number of small harbors along the coast. The minimum amount of equipment needed by one of these buyers is some of the slatted crates that usually hold about one hundred pounds of lobsters. The chances are good that he will also have a lobster car.³

3. See Chapter III, pp. 8ff. for a more complete description of this and other storage devices.

The small buyer may have on the wharf a shed in which he stores the small amount of gear he has, some of which - line, gloves, etc. - may be available for sale to the lobstermen. A few barrels of bait, redfish or herring waste, depending upon the location along the coast, complete his physical capital investment.

The practice of paying lobstermen cash at the time of sales is almost universal. Equally well established is the practice of extending credit to the lobstermen for gear, bait, and other supplies. For these reasons, the buyer must have a certain amount of money capital. (However, inadequate capital resources is the primary limiting factor on the small buyer's activities.)

The small buyer may be an independent businessman selling to the local retail trade as well as to other dealers who in turn will ship and sell to the urban markets. He may also do some selling directly to fish and lobster dealers in the Boston or New York markets. At least a few of the small buyers in Maine have been able, by means of establishing a reputation for a quality product, to obtain a higher price for their lobsters in New York. To do this, however, not only requires the requisite standards in buying, grading and packing lobsters, but it also requires a knowledge of the New York or Boston market, as well as adequate capital.⁴

4. For example, one of the smaller family dealerships in the Casco Bay area has established a successful business on the premise that there is a significant difference in the quality of lobsters. Aside from the influence of the season, this dealer ascribes importance to the area fished and purchases lobsters from only those fishermen who fish in the outside waters. These lobsters, it is asserted, are hardier, more vigorous, and are better able to withstand the shipping. Furthermore, their meat content, it is claimed, is higher than that of lobsters caught in the upper reaches of the bays, inlets, and coves. Thus, this dealer, by having established a reputation for a quality and standardized product, is able to obtain a higher price in the New York market.

A dealer, for instance, who does not grade his lobsters but merely forwards his lobsters as they are purchased, and who has limited, if any, storage facilities, is put in a poor bargaining position in the market. He cannot keep his lobsters for any significant period of time nor can he obtain any

better price by virtue of a differentiated and quality product. Thus, he is forced to dump his lobsters on the market at peak catch periods, adding to the price instability that has been so marked in the industry. The inadequacy of capital and need for cash is an additional factor that causes some buyers to sell their supply regardless of price or the condition of the market.

Actually, these limitations force many of the buyers to be merely commission agents of other dealers. In such cases, though they may own their own wharves and cars, they will rely on their principal to provide the capital for purchase of lobsters and extension of credit. In turn they must sell virtually all of their lobsters to the dealer at a markup of usually five cents per pound.⁵

5. In the last few years this spread has increased from 3-3½ cents each to the present 5 cents.

Sometimes this relationship of agent to principal is stable and lasts many years. This is apt to be true in the case of dealers who themselves sell direct to hotels, restaurants, or wholesalers and where a guaranteed and reliable product is a necessity. Dependable agents are a prerequisite in such situations. On the other hand, dealers that are primarily speculators on the markets with no sizable direct customer sales do not have to rely on a stable and graded supply and are apt to shift from one agent buyer to another even within a single season.

The larger dealers use a variety of arrangements in procuring lobsters. Firms such as those located in the center of a lobstering area can buy directly from fishermen at their wharves. They may also have their own smacks which operate on a fairly regular schedule through the adjacent islands and

harbors purchasing lobsters from the fishermen. Firms that have their own pounds for storage of lobsters will frequently purchase directly at the pound-site from lobstermen as well as through agents.

One of the most important of the functions performed by the dealer is that of storing the lobsters. From the viewpoint of the market, storage tends to even out the available supply, spreading the heavy catch of the summer and fall months throughout the year. Since many of the "shedders" caught in the summer are unable to stand shipment and have a low weight, high water content, storage and feeding of these lobsters result in an improved and more marketable product.

It is this storage function which also presents the dealer with his opportunity for profit, since he will buy as cheaply as possible, holding the lobsters as is practicable until he can realize the best price. When a dealer has a pound, this holding process will last for some time, possibly from early fall until late spring. If tanks and cars constitute his sole storage capacity, the lobsters will normally be fed and stored for a much shorter period.

The lobster cars that a dealer has are nothing more than large floating crates with usually a solid deck to walk on. They are twenty feet or more long, fifteen or more feet wide, and three or more feet deep. The sides and bottom are slatted in order to induce circulation. They are usually moored in a cove or harbor and thus make a convenient place for the dealer to buy his lobsters from the lobstermen who pull alongside, sort and store them in separate compartments in the car, all in one operation.

Though this is a cheap and easy method of storage, it is not suitable for more than short periods. Furthermore, since the car floats, it receives primarily surface water. If the harbor receives too much fresh water from

emptying streams, the salinity of the water may be reduced. A more prevalent problem in many areas is oil pollution which gives the lobster a "kerosene" taste. In such places tanks must be used.

Though the capacity of cars in such lobstering centers as Jonesport and Stonington exceeds 100,000 pounds, the total capacity in the state is reported to be less than a million pounds.⁶

6. See the table on Lobster Storage Capacity in Chapter III.

The storage capacity of tanks in Maine is even less than that of cars and as indicated in the table in Chapter III, most of the over 800,000 pounds capacity is in the southwestern and central part of the state with Portland alone accounting for over 135,000 pounds. In Boston the use of tanks is more important with well over 100,000 pounds capacity represented in a single dealer's establishment. The tanks themselves are flat and long, usually with a capacity of 1,000 pounds, and set in tiers. Clear salt water is continually piped and circulated in the tanks.

In this fashion a tremendous quantity of lobsters can be stored in a small space with maximum availability. The tanks are ideal for sorting and classifying the lobsters into various sizes and grades. Individual tanks can even be used to provide special treatment for weak lobsters that without such care as extra oxygen would be unable to withstand shipment in a live state.

In Maine the most important means of storage are the pounds. Indeed, Maine has the only pounds in New England, and most of these are located in the eastern part of the state where the many coves and inlets provide the natural environment for a pound.⁷

7. Such a pound does not refer to the many roadside lobster restaurants that advertise themselves as "pounds." A "genuine" pound in Maine is a dammed up cove or inlet, providing adequate circulation by tidal action of salt water and free of pollution and fresh water.

At present there are approximately 44 pounds in operation along the Maine coast.⁸

8. Chapter III lists the pounds with their location, capacity, and year built.

The total capacity of these pounds is almost four and a quarter million pounds of lobster with over three million of it accounted for by those in Knox, Hancock, and Washington counties. The largest single pound in the state will alone accommodate 450,000 pounds of live lobsters.

Although there were a few pounds built during the last quarter of the nineteenth century, the first quantitatively important construction came in the early years of the twentieth century. The explanation usually given for the initial growth in pounds is the increasing preoccupation with the shipments of live lobsters that occurred with the closing of the lobster canning industry. The shipping trade required some means of storage and allocating the concentrated catch over the whole year, and pounds provided a relatively inexpensive and logical answer.

Though Maine has the only pounds in New England, a number of the pounds are owned, leased, or co-owned by dealers to the west. A Massachusetts company, for instance, owns four pounds in Maine with a capacity of 450,000 pounds or 10.7 per cent of Maine's total pound capacity.⁹

9. Based on total capacity of 4,190,000 pounds.

Other pounds, though owned by Maine individuals or firms, are leased to dealers in Boston or elsewhere.

The pattern of stocking the pounds varies from firm to firm, in large part depending upon the type of customer the dealer supplies. If he has a high proportion of direct customers, such as hotels and restaurants, relying on him for supply all year long, he must use his pound as a guaranteed source of supply in winter and early spring months. Some firms, as a matter of custom, follow a regular pattern of stocking the pounds in May and June and again in the fall, making withdrawals in July and August if needed, as well as from February to early April. Other dealers, who sell most of their lobsters in New York or Boston markets, may stock the pound on a more erratic pattern, essentially geared to the hopes of making a speculative inventory gain by buying cheap and selling dear.¹⁰

10. All dealers who stock pounds necessarily take a considerable risk. Not only is the risk a matter of price fluctuations, but it is also related to the possibility of high mortality of the lobster from disease or other causes.

In a study of nine pounds reported in the Dow-Harriman-Scattergood article¹¹

11. Ibid., pp. 4ff.

all nine pounds made a practice of stocking in the fall, only five stocked in the spring while only three did so in the summer.

As indicated in the earlier reference to the arrival along the Maine coast of the smacks from Connecticut in 1826, an actual function of the dealer from the very beginning of the industry was to transport the lobsters from Maine to the markets outside of the state.

Smacks, either "dry" or "wet," constituted the earliest means of transportation and to some extent they are still used today.¹²

12. As described earlier in Chapter II, "wet" smacks are boats especially designed for lobster carrying and have a hold in which sea water freely circulates, providing the same storage conditions as a car. In a "dry" smack there are no peculiar storage facilities, the hold being like that of any cargo carrier.

The use of smacks is now pretty much confined to collecting lobsters in and around the islands, especially in Penobscot Bay, and transporting lobsters to Boston and New York from the Canadian provinces. The high operating and maintenance charges together with their limited usefulness has led to the replacement of smacks by other transportation methods. A Massachusetts firm which used to operate five smacks along the coast has disposed of them in favor of its own trucks, using dry hull boats only for its runs from Newfoundland and Nova Scotia. A number of the lobster dealers have their own trucks, employing them not only to pick up lobsters from the fishing area in Maine and Canada, but also to deliver lobsters to their various direct customers, going as far west as Chicago and St. Louis. Other dealers use public carriers, although to a certain extent in recent years there has developed some specialization since one particular trucking firm now appears to carry the bulk of the lobsters from dealers in Maine to the New York market.

Since World War II there has been a very marked shift to the use of trucks. This is particularly apparent in shipments to the Fulton Fish Market in New York. Table I indicates that of the total 3.7 million pounds of live lobsters arriving in the New York market in 1947, 56.7 per cent came by rail freight. By 1954 and 1955, rail freight shipments had shrunk to a relatively unimportant amount, though the total weight shipped to market had grown to over 8 million pounds. By 1954 and 1955, 99 per cent of all shipments of

live lobsters to New York were being made by truck. Table II presents a breakdown by point of origin of live lobsters arriving in the Fulton Fish Market and again the same concentration upon truck shipments is apparent regardless of origin of shipment, i.e. Maine, Massachusetts, or the Canadian provinces.¹³

13. The installation of so-called "tank set ups" into freight cars may in the future offset some of the change to truck transportation.

The shift in lobster shipment to truck transportation is part of a general trend in all fish products and at present almost ninety per cent of all fish shipments to the Fulton Fish Market are made by truck. Faster service, lower overall rates, door-to-door pick up and delivery have been the major factors in the shift to motor carriers.

The cost of shipping lobster by truck can at times be significantly lower than what rail express would be. For instance, shipment of lobsters from Rockland to Cleveland by truck costs about five cents per pound, while by rail it is at best eighteen cents per pound. Generally, within the New England area, it costs about two cents a pound when the dealer's own trucks are used.

Along with the shift to trucks as a means of transportation, there has come about a cheaper and more satisfactory method of packaging. Formerly, twenty-five and fifty-pound barrels were used, with barrels costing \$1.75. Shipment in this fashion was very expensive, adding about three cents to the cost of each lobster. Furthermore, there was the problem of returning empty barrels. Quality was affected, especially by the fifty-pound barrels, since the pressure of the lobsters upon one another tended seriously to

TABLE I

RECEIPTS OF NORTH ATLANTIC LOBSTERS AT NEW YORK CITY

BY FORM AND METHOD OF SHIPMENT, 1947, 1953-55

Form O:		Method of Shipment			
Lobster	Truck	Rail Express (thousands of pounds)	Rail Freight (thousands of pounds)	Boat ¹	Total Arrivals
Live					
1947	1069	503	2092	23	3687
1953	8521	44	--	41	8606
1954	8002	45	--	41	8088
1955	8864	57	--	15	8936
Boiled and/or frozen					
1947	7	1	--	--	8
1953	24	--	--	--	24
1954	4	--	--	--	4
1955	7	--	--	--	7
Meat, fresh or frozen					
1947	18	54	37	--	109
1953	528	5	--	--	533
1954	429	6	24	--	459
1955	799	1	--	--	800

Source: Market News Service, Fish & Wildlife Service, U.S. Dept. of the Interior

1. New York boat landings of lobster are those landed at the Fulton Fish Market from offshore draggers. These boats are usually out for fish and happen to pick up lobster during their general operations. They are employed in the waters off Long Island, Connecticut, Rhode Island and New Jersey. They generally land a very large lobster which has little commercial value as a live lobster.

TABLE II
 RECEIPTS OF "LIVE" NORTH ATLANTIC LOBSTERS
 AT SALT-WATER SECTION OF FULTON FISH MARKET, N.Y.C.
 BY POINT OF ORIGIN AND METHOD OF SHIPMENT
 1958

Point of Origin	Method of Shipment				Total Arrivals
	Truck	Rail Express (thousands of pounds)	Rail Freight	Boat	
Maine ¹	5057	40	--	--	5097
Mass.	4155	--	--	--	4155
N.B. or N.S. ²	585	--	--	--	585
Other ³	30	--	--	88	118
TOTAL	9827	40	--	88	9955

1. A significant number of lobsters reported as originating from Maine may be Canadian lobsters. Almost all the lobsters originating from Massachusetts are Maine or Canadian lobsters. People in the market are of the opinion that two thirds of the lobsters reported from Maine and Massachusetts are Canadian.

2. Direct shipments from Canada.

3. Includes Rhode Island, Connecticut, New Jersey and New York.

impair the condition of the lobsters packed in the bottom of the barrel.

About four years ago the industry began to use twenty-five pound vegetable crates. These crates are the standard crates used for fruits and vegetables. Initially the crates were very cheap, but more recently the cost has risen to about thirty-five cents a crate, or under a cent and a half per pound of lobster. Not only are these crates better packing instruments, but they are also more convenient since many customers of the wholesalers prefer the twenty-five pound package, which obviates the necessity of opening and repacking the large barrels. Handling and stacking of the vegetable crates in trucks and warehouses is easier, and with fewer lobsters in each container, there has been a lower mortality rate.

With the utilization to a limited degree of air shipments, a lightweight moisture-proofed cardboard container which can be packed, iced, and stapled shut, has been developed. Mortality with this type of container can be as low as one out of twenty-five lobsters. This reduced mortality more than makes up the fifteen cent difference in the total cost of fifty cents for each box.

Lobster shipments are made by the 200-odd firms and individuals classified as lobster dealers in Maine; and although this total has remained fairly constant for some time, there is considerable entrance and exit of dealers, especially the smaller ones.¹⁴

14. It is difficult to obtain precise data on the number of dealers and their size. The license issued by the state does not require a sufficiently high fee (\$35) or enough information to assure that all who purchase it are primarily lobster dealers.

There is great disparity among the two hundred Maine dealers as to their size and the nature of their operations. We have broken down this group into

a three-fold classification: Group A, the largest and for the most part, incorporated dealers; B, an intermediate group which has some incorporated organizations but in which most are unincorporated; C, a third group of small dealers and buyers scattered along the coast. At best this is a crude classification in which there is some overlapping between the groups. The grouping rests first of all on general knowledge of operations in the different markets. Somewhat greater precision is given to the classification by the examination of income tax data, information obtained by interviews and data derived from the antitrust suit of 1957.

It was not possible to obtain income tax data on the largest firms (Group A). However, this group is rather clearly distinguished because of its size and reputation and by data obtained by interviews. From this data it appears that the structure of the dealers is a loose-knit oligopoly with a competitive and highly unstable fringe. One firm is clearly the largest. Below this one there is a group of perhaps ten firms whose size is very roughly similar. (However, it should be emphasized that classification by size is of limited usefulness. Patterns of marketing vary considerably and firms of similar size may pursue widely differing policies).

The largest firm (located in Boston) handles approximately 10 million pounds of lobster a year, about half of which comes from Canada and half from Maine. This firm obtains these lobsters from dealers who are usually the company's agents or resident buyers. Whenever the company needs additional lobsters or whenever in their view the price is right, the company purchases additional lobsters from local dealers. Purchases are on a fixed mark-up basis. The company has two pounds, one in Maine and one in Canada. These two pounds plus extensive tank capacity in Boston give the company aggregate storage facilities of perhaps a million pounds. This storage

capacity is not operated primarily on a fall-spring stocking basis, but rather it is utilized whenever a good speculative opportunity presents itself.

This firm sells most of its catch in the New York wholesale market, although it does sell elsewhere when the price is advantageous or when excess inventory must be moved. In addition, the firm is active in supplying the Florida market by air.

The speculative, quick turnover basis on which the largest firm operates may be contrasted with the operations of what is probably the second largest.

This second firm, also a Massachusetts organization, has about 1,200 customers over the United States which it serves regularly.¹⁵

15. Albany, Cleveland, Detroit, Los Angeles, Minneapolis, Oklahoma City are a few of the areas covered.

However, when the company has surplus lobsters, it sells them at the Fulton Fish Market or to Boston dealers, and when it must dispose of lobsters quickly it sells through retail food chains, usually in Boston where they are often used as a very attractive loss leader.

Close connections with so many customers permits this firm to attain a degree of price stability which is unusual in the fishery. In the winter and early spring months when market prices in New York and Boston are high, this firm sells to regular accounts at lower prices. The reverse situation is true during the summer glut. This practice requires considerable "account education" but when backed by good service, it is apparently successful. Greater price stability enables the firm to engage in more planning and

especially to estimate profit margins better.

This firm not only employs salesmen and offers considerable direct customer service, but it spends about \$100,000 annually on advertising and other sales promotional activities. This firm feels strongly that its expenditure on sales promotion and customer services help it and the industry. However, it must be pointed out that handling a large amount of customers is complex and expensive.

In the past few years annual sales have been about \$3 million. Most of these sales have been to the final purchaser. These sales have involved the following capital requirements:¹⁶

\$200,000	accounts receivable
300,000	to stock pounds
345,000	line of bank credit
<u>25,000</u>	lobsters on premises
\$870,000	TOTAL

16. Data supplied by interview.

This company purchases one-third of its lobsters from Maine, one-third from Nova Scotia, and one-third from Newfoundland. In Maine and Nova Scotia it obtains its lobsters from lobster buyers who have regularly and traditionally sold to them. The company buys from them on a fixed mark-up commission basis and occasionally advances money. The shipment of lobsters from these sources is by company trucks and chartered boats. The company trucks pick up regularly from Maine sources and also deliver about half the amount which annually originates from Nova Scotia. The remaining Nova Scotia lobsters and all Newfoundland lobsters are delivered directly to the company's facilities in Massachusetts by dry hull boats. Shipment to customers is made by company trucks as far west as St. Louis.

The large dealers in Maine tend more to pattern their activities on the first dealer rather than the second, although there are notable exceptions to this.

The firm that appears to be the largest in Maine prefers to sell to secondary wholesalers primarily in New York, but also in other areas. Selling to the wholesale market frees the firm from the overhead costs associated with the greater care required in the selective packing and shipping for numerous small accounts.¹⁷

17. A final type of organization is those firms who are essentially brokers rather than dealers in lobsters. The terms "broker" and "dealer" are not used in a strict sense in this passage, i.e. the brokers indicated above may take title to the lobsters but because of inadequate storage facilities are forced to sell before the merchandise is delivered.

In the smaller firms the operations are not so diverse, and they consist mainly of buying as cheaply as possible, storing to the extent physically and financially possible and selling to the wholesale trade and to other large dealers.

As is true in many industries, small dealers are able to survive profitably on the basis of product differentiation.¹⁸

18. See note above.

The basis for this qualitative difference is very real. Lobsters like all other animals vary greatly in appearance, meat content, degree of hardness, etc. (appearance includes coloration, activity, and also defects, i.e. one claw, feeler torn off, etc.). Unfortunately a significant portion of the Maine catch that is shipped out is qualitatively defective. The reason for

this is that the New York market will absorb all kinds of lobsters at a price, and too many Maine dealers are compelled to ship whatever they have on hand. The pressure to ship is two-fold. First of all, to establish storage room for new shipments they will receive, and secondly, to obtain the cash to pay for the next load. If anywhere from 10 to 30 per cent of the Maine catch were held off the live market, i.e. processed for meat, because of its poor quality, the entire fishery would benefit.¹⁹

19. The lobstermen tend to be careless with the catch. If there were a premium on quality, then it is likely that there would be many fewer lobsters maimed in handling. Dealers normally buy a straight run, i.e. paying the same price (except for shedders) for all the lobsters a fisherman has regardless of quality.

The small dealers' problems also stem in part from their lack of business experience. Many have come from the ranks of the fishermen and so have little general business experience to guide them in record and bookkeeping, the location of sources of capital, and other elementary business knowledge and skills. Their lack of business know-how and of conditions within the metropolitan markets is also a severe handicap when dealing with the large wholesale markets.

We suggested above a three-fold classification for the Maine dealers. As noted, income tax data were not available for the largest size category, Group A. However, revenue and expense information was supplied for Groups B and C.²⁰

20. For Group B a list of twenty-eight firms was submitted to the Bureau. From this list it was possible to select returns of four incorporated firms (Form 1120) and five individuals (Form 1040). The data for these two sub-groups are given in Table III.

Table III indicates within the limits of the sample size, using median aggregate revenue, that the incorporated dealers are almost three times larger than the unincorporated and also that both elements in the B group are larger than those in C.²¹

21. Beyond gross sales or receipts, the figures do not appear particularly revealing, i.e. profit rates as indicated do not seem to reflect the true economic profitability of the larger incorporated dealerships.

The ratio of debt to total assets for the incorporated dealers is high but probably not unduly so for this type of business. The low ratio of fixed to total assets is consistent with what is known about the inventory and speculative nature of the business. However, in these relatively small businesses the intermingling of salaries and profits and the lack of detailed knowledge of how specific accounts are handled precludes any precise analysis. The utility of the data, therefore, is unfortunately limited to seeing if the indication of the relative sizes of the different dealer groupings is in agreement with what has been asserted about different dealer operations.

DEALER ORGANIZATION

The lobster dealer is faced with a high degree of price variability and a consistent threat of easy entry. Yet, in spite of this instability and competitive pressure, many of the lobster dealers are in close contact with one another. In part this contact performs a necessary and valuable function--it makes the market. Price information from New York and Boston is passed along the coast from dealer to dealer. Based on what is learned in those ubiquitous phone calls, supplies of lobsters are located, traded between dealers, and shipped to the wholesale markets. However, these ties between the dealers have been articulated into formal and informal organizations on more than one occasion.

TABLE III
REVENUES AND EXPENSES
Maine Lobster Dealers 1956

Group B

Individual (Form 1040) (Sample size 5)

	Mean	Median	Range
(2) Total receipts	\$81,900	\$89,500	\$ 7,900-147,300
(3) Gross profit	10,100	8,100	5,800- 16,200
(4) Total other business expenses	2,400	2,200	0- 5,700
(5) Net profit	3,700	3,900	2,200- 5,000
Return on receipts	4.5%	4.4%	28.4%- 3.4%

Incorporated (Form 1120) (Sample size 4)

	Mean	Median	Range
(6) Gross sales	\$257,100	\$257,500	\$178,300-335,000
(7) Gross profit	48,200	50,500	35,000- 56,700
(8) Net income or loss	2,400	3,300	3,400- 6,600
(9) Bldgs. & other fixed depreciable assets	21,500	23,600	14,700- 24,300
(10) Total assets	80,000	62,300	56,200-139,400
(11) Bonds & notes payable	11,900	8,200	0-31,200
(12) Accounts payable	5,200	4,100	500- 12,300
TOTAL DEBT	17,100	12,200	500- 43,500
Return on sales	0.9%	1.3%	2.0%
Return on assets	3.0%	5.2%	4.7%
Debts to assets	21.4%	19.7%	0.9%- 31.2%
Ratio of fixed to total assets	27 %	38 %	26 %- 17 %

REVENUES AND EXPENSES

Maine Lobster Dealers 1956

Group C

Individual (Form 1040) (Sample size 16)

	Mean	Median	Range
(2) Total receipts	\$79,700	\$73,100	\$7,800-167,500
(3) Gross profit	11,200	9,100	2,900- 39,900
(4) Total other business expenses	4,200	1,500	0- 37,100
(5) Net profit	3,700	3,700	3,200- 13,300
Return on receipts	4.6%	5.0%	8.0%

FOOTNOTES

1. See text for method of classification.
2. Line 1 Schedule 1 (Form 1040)
3. Line 10 Schedule 1 (Form 1040)
4. Line 21 Schedule 1 (Form 1040)
5. Line 23 Schedule 1 (Form 1040) (also line 8, p. 1)
6. Line 1, p. 2 (Form 1120)
7. Line 3, p. 2 (Form 1120)
8. Line 41, p. 3 (Form 1120)
9. Line 8, p. 4 (Form 1120)
10. Line 13, p. 4 (Form 1120)
11. Line 16, p. 4 (Form 1120)
12. Line 14, p. 4 (Form 1120)

Source: Bureau of Internal Revenue, Augusta

In 1951 a formal trade association was formed to promote the sale and distribution of lobsters.

The North Atlantic Lobster Institute is a non-profit corporation comprised of lobster dealers from Canada, Maine, and Massachusetts, who in the aggregate handle an estimated 75% of all true lobsters distributed in the United States. Its purpose is to promote, foster, and encourage the marketing and consumption of North Atlantic lobsters and lobster products. To this end, the North Atlantic Lobster Institute, its members, and affiliates are making every effort to provide the restaurant, hotel and club operators, the retailer, and the general public with full information upon the scope and variety of uses to which North Atlantic lobsters can be put. At the same time, the North Atlantic Lobster Institute is engaged in studies to improve the methods of catching lobsters, storing, preserving, packaging, and distributing them with a view toward bringing the benefits of lobster consumption to a constantly increasing number of American consumers. We feel confident that your interests will best be served by patronizing these forward-looking progressive lobster dealers.²²

22. North Atlantic Lobster Institute, Directory of Members and Associates (Portland: 1952), p. 2 as quoted in Robert D. Witherill Marketing Maine Lobsters (M.A. thesis, University of Maine, 1953), p. 77.

The Institute attempted to improve packaging, to assist members in obtaining good accounts and to carry on promotional activities in various cities using diverse advertising media. The Institute further published a "lobster bulletin," in which it reported its activities and other items of interest to the trade.²³

23. One of the Institute's more advanced plans was the marketing of boiled lobster.

The association was run by a Portland advertising agency and this caused a certain amount of friction with some dealers who refused to join. Apparently the service provided was not useful enough to the dealers, and it was

discontinued in 1955. There was some carry over, however, between the activities of the Institute and the legal troubles of the industry in 1957.

In 1955 and 1956 the Maine Lobstermen's Association had been making some headway in organizing the fishery. The Association's progress was aided by the condition of the relationship between the dealers and the fishermen which has always been somewhat antagonistic.²⁴

24. There are, of course, notable exceptions to this.

These relationships have been in part paternalistic. In these cases, the dealer often supplied capital and equipment in return for monopoly buying power. There was growing dissatisfaction along the coast with this type of obligation.²⁵

25. In its extreme form in some areas quite analogous to sharecropping.

In addition, the dealers and the men are separated by personal social barriers and the dealers' feeling of occupational superiority.

Faced by the threat of organization with its possible impact on supply and price, the dealers in 1957 requested the government to investigate whether or not the fishermen's organization was violating the anti-trust statute.²⁶

26. Statement by Mr. Philip Willard in court.

The government complied but also indicted the dealers on similar charges.

Four corporations and three individuals were charged with the following conspiracy:

Beginning in or about July 1957 and continuing thereafter to the date of the return of this indictment, the defendants, the co-conspirators, and other persons to the Grand Jury unknown, have engaged in a combination and conspiracy to fix, stabilize, and maintain a maximum price to be paid by them for live Maine lobsters, in unreasonable restraint of the aforesaid interstate trade and commerce in live Maine lobsters, in violation of Section 1 of the Act of Congress of July 2, 1890, . . . commonly known as the Sherman Act.²⁷

27. United States of America v. Maine Lobster Co., Inc., Samuel L. Armstrong, E.C. Palmer, Inc., Benson Lobster Co., The Willard-Daggett Co., John E. Willard, Jr., Charles E. Olsen (1957), Criminal Action No. 57-36, p. 4.

The following verdicts were returned:

<u>Defendant</u>	<u>Plea</u>	<u>Fine Imposed or Other Disposition</u>
Maine Lobster Co., Inc.	5/9/58 - not guilty 8/5/58 - change of plea to nolo contem- dere	Adjudged guilty 8/5/58; fine, \$500
Samuel L. Armstrong	5/9/58 - nolo contem- dere	Adjudged guilty 5/9/58; fine, \$500
E.C. Palmer, Inc.	5/9/58 - nolo contem- dere	Adjudged guilty 5/9/58; fine, \$750
Benson Lobster Co.	5/9/58 - not guilty 8/5/58 - change of plea to nolo contem- dere	Adjudged guilty 8/5/58; fine, \$500
The Willard-Daggett Co.	5/9/58 - not guilty 8/5/58 - change of plea to nolo contem- dere	Adjudged guilty 8/5/58; fine, \$1,000
John E. Willard, Jr.	5/9/58 - not guilty 8/5/58 - change of plea to nolo contem- dere	Adjudged guilty 8/5/58; fine, \$250
Charles E. Olsen	5/9/58 - not guilty 8/5/58 - plea with- drawn	Dismissed on motion of the Government 8/5/58

At no time that we can discover have the Maine dealers been organized to fix prices in the wholesale market. This conspiracy was against the lobstermen. The antagonism between the men and the dealers in this dual conspiracy is well established in the record of the trial. Pressure was

put on the lobstermen in a variety of ways. One device was refusal to buy except from those men who they traditionally bought from, i.e. there could be no shopping around.

Well, that was a different situation, and I went over there and asked him if he could buy my lobsters last summer, and he said no; he said, "I don't dare to buy your lobsters." And I said, "Why don't you dare to buy my lobsters," and he said, "Because they won't let me." He said, "If I buy your lobsters, Mr. Burgess, all of my customers right now will be cut right off from their bait supply." And that's what he told me.²⁸

28. United States of America v. Maine Lobstermen's Association and Leslie Dyer (1958), Criminal Action No. 57-35, Vol. V., p. 714.

Even more important was the question of the bait supply:

Q: Now, during the year 1957, were you not in attendance at meetings where the members were telling about the fact that they were unable to buy bait unless they bought it from the dealers and then were forced to sell their lobsters to the dealers in order to get the bait?

A: Yes.

Q: And isn't it a fact, Mr. Cushing, that some of the members up and down the coast were complaining at these various meetings because the dealers were financing their boat and equipment, that they had to do what the dealers insisted they do because they were in hock to the dealer?

A: That is correct.

Q: And isn't it a fact because of the bait situation as well as the fact that some of the fishermen felt as though they were under the thumbs of the dealers, that they were suggesting that they be helped?

A: That is correct.

Q: Isn't it also a fact that at these meetings, the fishermen were complaining that the dealers who owned islands were insisting that they pay 3¢ a pound for all lobsters caught around the islands and that was one of the reasons that they wanted to tie up, to avoid paying this tribute?

A: That is correct.²⁹

29. United States of America v. Maine Lobstermen's Association and Leslie Dyer (1958), Criminal Action No. 57-35, Vol. VIII, pp. 1118-1125.

Dealer concern with the threat posed by effective organization of the fishermen centers in several areas. Each dealer is particularly anxious about his own supply.³⁰

30. See the reference in the testimony above to the islands that are owned and the "leasing" of the fishing rights in adjacent waters. This extra legal practice insures certain dealers of a supply of cheap lobsters. See the Portland Press Herald (May 23, 1954) for an article on the valuation of such an island when the United States Navy attempted to purchase it.

He must have merchandise to sell, and since in fishing many factors may affect the catch, the dealers see certain advantages in strong ties with the men. At the same time, however, the lower the price in the summer, the greater is the potential profitability of their storage capacity. Finally an effective organization of fishermen that had competent management and adequate storage capacity could perform the dealer's functions at least to the point of selling in the New York market.

Today the fishermen's organization is negligible and yet prices are high enough to keep the men reasonably well off. However, this conflict between the men and the dealers is, given current attitudes on both sides, endemic and apt to be renewed whenever adverse conditions arise.

A final aspect of Maine dealer operations is in the processing of lobsters. Almost all dealers are forced to process (boil) some meat but most do it as a last resort and then sell the meat on the local market for what it will bring.

A number of firms are, however, engaged in the manufacture of lobster products.³¹

31. Whole frozen lobster, frozen lobster tail, lobster paste, lobster stew, lobster newburgh, lobster t.v. dinner, etc.

To date these activities have been carried out by relatively small packers and canners, who operate during the summer when prices are low. However, more recently one of the largest dealers has actively entered this field. In addition, the improvement of techniques of freezing and packing will permit much better utilization of lobsters not fit for live shipment. This is particularly important, because if there were a good market for less than first-class lobsters, it could become the basis for qualitative improvement in what is shipped live.

THE DISTRIBUTION OF BAIT

The principal bait used in the fishery whenever it is available is ocean perch (redfish). Redfish was first caught in large quantities toward the end of the 1930's when frozen ocean perch fillets became popular.¹

1. Chart 2, "Quantitative Aspects of the Fishery" compares redfish and lobster landings.

Redfish apparently has biological advantages as lobster bait although herring is still used, especially in the eastern areas.²

2. In experiments conducted by the Department of Sea and Shore Fisheries, redfish was rated 25-29% more efficient as bait than herring. Dow, Trott, op. cit., p. 8.

There have been many attempts to manufacture artificial bait, none as yet successful. An effective artificial bait would be particularly welcome by the fishermen because of its dependability of supply and probably less offensive odor. Also artificial bait would reduce the danger from infection caused by constantly handling rotting fish. See the Maine Coast Fisherman Vol. 13, 10, and 11 (May and June, 1959) for a discussion of an attempt to manufacture artificial bait.

The supply of bait (that not caught by the fishermen for their own use) is a by-product of the groundfish filleting plants. The principal Portland bait company began as an independent company obtaining redfish waste from filleting plants and selling bait in Portland and down east along the coast. At the same time certain Portland dealers had also been carrying on a bait operation. However, the dealers did not like the handling of bait and they agreed in 1957 to support a unified operation.³

3. The handling of bait is extremely messy and most health laws forbid the presence of bait, dead fish, in the same building with fresh food.

Now these dealers in Portland send all the lobstermen selling to them to the bait supplier with a credit slip. Upon presentation of the slip the lobstermen will receive the designated amount of bait. The lobstermen are billed for bait costs which in turn will be charged against the next catch which they bring to the dealers.

In addition to supplying lobstermen in the Portland area, this bait concern also supplies, by truck, several buyers and dealers along the Maine coast. In the summertime the bait company also sells to two dry smacks which go down east to buy from fishermen and buyers.

There are two or three other bait suppliers who operate from Portland but do not sell in that particular market. The largest of these operates four trucks and supplies many buyers along the coast. All these firms obtain their redfish from the fish companies located in Portland. Recently these companies have been selling their redfish scraps or cuttings to the bait dealers for \$30 a ton. When the bait dealers do not take the scrap, a fish meal company in Portland will buy it for \$18 a ton. To some extent this price differential may be justified for two reasons: one, the bait dealers are given the first opportunity to buy the scrap, and two, the fish meal concern has installed the worm gear and dump box to facilitate collecting the scrap and is willing to empty the box of scrap, whenever full, at any time during the day or night.

Occasionally when redfish-cutting are in short supply, the bait suppliers may go to Gloucester. On the more frequent occasion when supply is tight in Gloucester, the bait suppliers come up to Portland. Fishing boats also bring redfish into Rockland and some bait is available from that source.

Since the war the cost of redfish cuttings has tripled and now is at its high of \$30 a ton. The price of salted redfish has also risen considerably for the lobstermen. (The fish scrap is salted in order to avoid attracting crabs to the lobster pots.)

1940	\$2.00 per barrel
1945	\$4.00 per barrel
1950	\$6.00 per barrel
1955	\$7.00 per barrel
1959	\$9.00 per barrel

It should be emphasized that the lobster fishery is heavily dependent on the landing and processing of groundfish, and many times local shortages of bait have restricted lobster production.

THE WHOLESALE MARKETS

Once a Maine dealer has purchased lobsters, his disposition of them is essentially in one of two kinds of markets. The first is the fish market in either New York or Boston; the second, a direct market, consists of food wholesalers, restaurants, hotels, chain stores, and other users throughout the lobster consuming area of the country. While some dealers operate in only one of these two kinds of markets, most dealers are apt to be concerned with both, though in widely varying proportions.¹

1. Aside from the sale of lobsters through these means, it should be noted that there is a more or less continuous trade among the dealers themselves. Some dealers estimate, for instance, that they buy almost one third of their lobsters from other dealers. There is also considerable direct retail trade in Maine in the summer.

Though it is impossible to get any precise breakdown of the final market distributions of Maine lobsters, it is clear that the New York market absorbs a very large portion of Maine as well as Canadian lobsters. The annual amount of lobsters sold through the Fulton Market is about ten million pounds. The Fulton Market handles primarily Maine and Canadian lobsters, as Massachusetts landings of lobsters are largely absorbed in the local and Boston markets.²

2. See Table II, "The Marketing of Lobsters."

With Maine landings and Canadian imports, each amounting to about twenty-two

million pounds annually, the sales in the Fulton Market itself account for about twenty-three per cent of the total supply.

The New York lobster market may be roughly broken into two parts - the Fulton Fish Market wholesalers and the uptown brokers (14th Street). The latter are brokers in the sense that they rarely see or handle the merchandise themselves. They purchase lobsters from dealers along the coast who ship by truck to New York. Shipments are delivered to the customers of the broker from the freight station of the trucking firm.

Within the Fulton Market, the wholesalers have facilities for handling and storing lobsters and they usually deal in other species of fish. (The uptown brokers are apt to deal exclusively in lobsters.) Though there are advantages for the general fish dealer in the Fulton Market, the cost of doing business there is considerable, perhaps adding more than five cents a pound to the cost of lobsters.

The cost disadvantage is partially offset by the ability to display and inspect some species of fish. However, this is not an important feature insofar as lobsters are concerned, because usually the size of the order and the pressure of time do not permit opening and inspecting of crates. Lobsters usually arrive at the market in twenty-five pound crates and these are only opened to accommodate purchases of less than twenty-five pounds. Such purchases constitute a very slight portion of the total market.

Generally, the common carriers arrive in the market between 5 and 6 in the morning. By 8 or 9 o'clock, the merchandise has been moved out. Although the time span between delivery and sale is short, the Fulton Market wholesalers become involved with more handling than do the uptown brokers. This is true even though, as noted above, crates are seldom opened.

Though there are probably fifty wholesalers and brokers in the New York

market, less than ten of them account for ninety per cent of the lobsters coming into the city, and three of the uptown brokers account for about half of the trade. It is estimated that the largest firm may account for thirty per cent of the market.

Almost all, about ninety per cent, of the lobsters sold in the New York market are finally consumed in the New York metropolitan area.

Aside from disposing of a great volume of lobsters, the New York market also serves a number of other important functions. Obviously, it is to a considerable extent the price setter for the industry.³

3. See the appendix, "The Distribution of Bait" for a more complete analysis of the way in which price is determined.

Though there may be a number of different prices at any one time in other markets throughout the industry, the price in New York is the dominant one to which all other lobster prices must eventually be related.

In periods of general tight supply, the price of lobsters in the New York market is apt to be higher than elsewhere. This is because a fairly large portion of the New York market represents sales to customers whose demand is quite inelastic, i.e. they must have the lobsters regardless of price. This share of the total market must, therefore, be satisfied and dealers will attract by a higher price such supplies as they require for this purpose.

On the other hand, in periods of abundant supply, the New York market is apt to become an outlet for surplus lobsters from other channels of distribution. Because of its size, many contacts and potential customers, the New York market can absorb almost any amount of lobsters, although at reduced prices; i.e. demand becomes elastic at lower prices. On such occasions, when disposing of surplus lobsters, the New York price will be somewhat lower

than that prevailing in some of the more isolated and stabilized markets.

It should also be pointed out that even within the New York market, there are price differences at any one time which result from such degree of product differentiation as is possible. Dealers selling to New York who are known to sell a good product are able to obtain a slightly higher price than other dealers who are careless or negligent in the packing, handling, and shipping of lobsters.

A relatively new and important factor contributing to a high elasticity of demand at lower prices is the chain store. When lobsters are in the fifty to sixty cent range, chain stores become interested in them as a product to feature in order to draw customers to their stores even though they may sell the lobsters at cost, or even less. The potential magnitude of this market is indicated by the ability of one large supermarket chain to sell over 100,000 pounds of lobsters in a week.

While the supermarkets and chain stores only become interested at the lower prices, the impact of their demand is such that it stabilizes the price in the market at a high level. Whereas the price in a buyer's market ten years ago might have been brought down to a twenty to thirty cent level, it now usually tends to be stabilized at a level of fifty cents or more.

Not only does the New York market absorb any surplus production, but it also regularly serves as the "dumping" ground for all "distressed merchandise." This includes all those lobsters which, while once in good condition, have deteriorated or have been damaged and can only be sold in a large market with a variety of outlets. In addition, there is a considerable volume of lobsters sold in which the nature of the "distress" is entirely the financial condition of the dealer who is under pressure for cash and must dispose of his lobsters regardless of storage facilities or the condition of the market.

On a long term basis, the continued growth of the New York market as far as lobsters is concerned is doubtful. The development of the brokers in New York operating outside of the Fulton Market has already placed dealers in the Fulton Market at a competitive disadvantage, especially since there is little that the Fulton dealers offer in the way of physical processing, inspection, display, or other handling of the shipments.

The primary cause of any future decline in the relative importance of the New York market will be due to the increased development of direct ties between the lobster dealer and wholesalers or customers inland.

Of course, some of the oldest dealers in the industry established their businesses by direct selling to restaurants, hotels, and clubs and have maintained this practice ever since. To carry on such a "customer" trade as this requires assurance of an adequate supply of lobsters the year around, and this necessitates storage capacity as well as additional capital resources.⁴

4. Specialty sales to individual customers is profitable as one flourishing mail order shipping organization in Maine will attest.

Sales to these customers also involves extending a considerable amount of credit to buyers and the carrying of a large amount of receivables. Furthermore, to handle these accounts means a great deal of paper work, more direct contact with and servicing of the customers and a great deal more than the usual amount of care and responsibility for the quality and dependability of shipments. It is quite clear that a number of dealers are either unable or unwilling to provide this "servicing" of customer accounts.

On the other hand, once such a clientele is established, the dealer enjoys a great deal more stability in his price and sales. A dealer who

sells primarily to the customer trade will try to satisfy most of his demand in the winter months from his own pound holdings which he purchased at the peak production period the previous summer and fall.

One of the recent developments that is leading to a greater emphasis on direct sales between the lobster dealers and the food wholesalers and users inland is that of the "fresh water setup." These are tanks using circulating artificial salt water in which lobsters can be kept alive for a considerable period. (Except for the use of artificial salt water, these tanks are essentially the same as those used for storage in Maine.) Such tank setups are of two types - wholesale setups which may hold well over 20,000 pounds of lobsters and cost upwards of \$50,000 and smaller retail tanks designed for restaurants, hotels, and other final users.

The chief advantage in the wholesale tank setups is that relatively large shipments by truck can be made to these points without having to time arrival for immediate consumption. However, great care must be exercised to ensure the survival of the lobsters in the tanks. In the first place, vigorous and healthy lobsters must be shipped. Equally vital are the construction of the tanks, the salinity, oxygen content and temperature of the water, as well as the danger of overcrowding the tank. Nonetheless, with proper care and equipment, a high percentage of lobsters will survive.

While many of the present wholesale tank setups are in the northeast where they are easily supplied by truck, one is currently being operated in Florida and is supplied by air freight from Boston. The limiting factor in geographical expansion would then appear to be the durability of lobsters for shipment together with the cost factor of the shipment itself.

The interest in such setups is increasing both from dealers and inland buyers. The dealer views this market as a means of stabilizing the market

as well as expanding the demand for lobsters. Maine dealers that have already either built their own tank setups or sold to them have been impressed by the extent to which demand for lobsters holds up in the winter season, thus helping to even out the seasonal fluctuation in sales. Less variability in sales creates greater price stability than is currently the case in the New York market.

One of the most successful inland wholesale setups is in Springfield, Massachusetts. This is a wholesale outlet, but it also attracts and sells to retail customers who are intrigued by the live lobsters in the water and other promotional devices. Not only has this therefore developed a larger home consumption of lobsters, but it has also generated added demand for lobsters in the hotel and restaurant trade.

It has been asserted that a market such as Cleveland, which is currently using about a half million pounds of lobster annually, could easily be doubled through the utilization of tanks and proper sales promotion. It will not take many increases of the magnitude suggested as possible in the Cleveland area to effect a major change in the fishery. If twenty major urban areas increased their consumption by only half the amount suggested for Cleveland, five million pounds (roughly ten per cent of the United States catch plus Canadian imports) would be withdrawn from the New York and Boston wholesale markets with beneficial price effects.

The development of these pools or tanks in inland centers puts new demands on the dealers which tend to contribute to certain changes and trends that appear to be evident in the fishery.

Whether the dealer directly enters the pool business or merely supplies them, he must in any case be able to provide lobsters as needed. This puts increased emphasis on the dependability of the lobster supply. To ensure

a dependable supply requires both closer relations with Canadian lobstermen and additional storage capacity, especially pounds, and to fulfill these requirements, additional capital resources are needed.

The lack of capital has been a limiting factor for some dealers who would like to seize the opportunity for expansion forward with tank setups and backward with additional storage and supply arrangements. Even if the dealer does not own and operate the inland pools, he must give credit to the tank operator. This, of course, is quite different from selling for cash in the New York market. In effect, he must expand the credit he extends at both ends of his operation, i.e. to the lobstermen and to his customer.

An additional item of expense that occurs with this type of operation is advertising and promotion. Some of it is necessarily involved in the establishment of any new inland tank installation. Much more of this will have to be done as new market areas are invaded where lobster eating at home or in a restaurant has not been frequent.

To accomplish these ends, the industry will have to develop new sources of money capital. Banks and other lending agencies must become familiar enough with the fishery and the tank program to be willing to advance funds both for working capital and new installations.⁵

5. This report is being prepared just at the time tanks are coming into widespread use. If the potential demand for lobster is as large as the proponents of the tanks suggest, the fishery is on the verge of a major upheaval. For example, at present there is a tank setup under construction in Phoenix, Arizona, an area never before serviced with fresh fish. Lobsters will be flown to the Phoenix tank at a cost of about twenty-five cents per pound. (If return air cargoes were available from Phoenix, then the cost of shipping by air would be greatly reduced.) If this proves profitable, it is planned to install tanks in freight cars using the cars as storage and also for shuttle transportation of lobsters between Phoenix and major west coast cities. These are the tentative plans of a New York dealer.

If, in time, markets such as the west coast, middle west, and southwest can be profitably served on a larger scale, the crucial question will become

the availability of supply. On this basis, one may expect moves toward backward integration by the large distributor in order to insure supply. This may take many forms, i.e. direct contracts with fishermen or fishery cooperatives, etc. In any event, current marketing arrangements would be bypassed.

The use of air transport is, under certain circumstances, less costly than one might suppose. At the present time increasing numbers of Newfoundland lobsters are being flown to New York. These lobsters are loaded to take the place of the weight of gasoline used up on the flights from Europe and so they move at quite reasonable rates. These lobsters are shipped dry in cardboard containers.

PRODUCT COMPETITION IN THE WHOLESALE MARKETS

Maine lobsters face competition from two directions. On the one hand, Canada produces and ships live lobsters into the United States market. Except for a small qualitative advantage, in favor of Canada, Canadian lobsters are identical with Maine's, Homarus americanus.⁶

6. In addition to Maine, the states of New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Delaware all produce lobsters. Since 1947 Maine lobsters have averaged seventy-eight per cent of the total United States production. (Massachusetts is the second largest producer.) However, in the middle 1930's, Maine production was only sixty-five per cent of the United States output.

A second and more recent source of competition has been from so-called processed lobster products. The most important of these to date has been "frozen lobster tail" from South Africa.⁷

7. Products that are not biologically lobsters but species of crayfish.

Canadian imports of live lobsters first assumed importance at the turn of the century. Prior to that time, the bulk of the Canadian catch was canned. But with the stabilization of that phase of the industry, attention was shifted

to the exportation of live lobsters which offered the best opportunity for the expansion of income and employment for the Canadian fishermen.

The Canadian Lobster Commission of 1898 reported the following:⁸

At first this trade was mainly confined to western Nova Scotia, Shelburne, Yarmouth, and Digby counties, but within the last five years it has expanded rapidly eastward as far as Canso, where a large export trade has been done, and more recently it has been extended to Louisburg and even as far as Port Morien in Cape Breton.

8. Report of the Canadian Lobster Commission 1898, Supplement No. 1 to the Thirty-First Annual Report of the Department of Marine and Fisheries, 62 Victoria, Sessional Papers, No. 11c, A189 (Ottawa: April 25, 1899), p. 9, 10.

The Commission at the time was concerned that the lobster fishery, as it became more deeply involved in the live lobster trade, would tend to market lobster from all parts of the coast at the same time and glut the market. To avoid this the Commission established five seasons, a series covering to some extent successive periods of time along different parts of the coast.

At the same time the Commission was very interested in establishing a market for lobsters in Europe. In addition, the Commission was of the opinion that the U.S. lobster fishery was exhausted and was hopeful that what were formerly Maine markets would open to Canadian lobsters. These questions were of considerable importance since at the turn of the century the Canadian fishery was employing from 15,000 to 20,000 men.⁹

9. Ibid, p. 12.

The ability of the Canadian lobster fishery to absorb an increased number

of fishermen is in contrast to the Maine situation where the coastal population decline evidently could not be halted by employment in the lobster fishery.

In 1926 opportunities for the export of live lobsters to the United States were substantially improved with the introduction of shipment by refrigerated railroad freight cars.¹⁰

The new plan proved to be so profitable and the business grew so rapidly that since the year 1927 the fishermen of the Maine coast, especially, have not been able to make a decent living from lobster fishing owing to the influx of cheap lobsters from Canada which have controlled the price in this country.

10. Eighth Biennial Report of the Commissioner of Sea and Shore Fisheries State of Maine (1934), p. 5.

In recent years shipments have been made by truck especially since the opening of ferry service from Yarmouth, Nova Scotia to Bar Harbor, Maine.

It was in the period of depression during the thirties that Maine interests became concerned with competition from Canada. The plight of the Maine fisherman, who was born and reared in Maine, whose market was being inundated by the Canadian product, was the subject of considerable inquiry. In the Sea and Shore Fisheries Biennial Report for 1941 it was again commented that, "Canadian competition is the lobster industry's biggest problem."¹¹

11. State of Maine Eleventh Biennial Report Department of Sea and Shore Fisheries (Boothbay Harbor: 1941), p. 22.

Meetings were held with Canadian officials to improve the situation. Nevertheless, no concrete program or recommendations were reported, and importation of Canadian lobsters has continued. These imports have amounted to over 20 million pounds annually since 1948. The canned product is also imported

from Canada; over 8 million pounds (canned meat weight adjusted to live lobster weight equivalent) were imported in 1957.¹²

12. In the Eleventh Biennial Report of the Maine Department of Sea and Shore Fisheries, (Ibid.), it was reported that the Department had banned the sale of canned Canadian lobster meat in Maine due to an investigation which had shown that a large percentage of the meat had come from lobsters below the legal Maine size. The ability of Canadians to can lobsters smaller than the Maine legal size provides the Canadian packer with a lower cost of supply. This situation presents competitive difficulties for the Maine canner or processor since his supplies are at higher cost.

Although there is still critical comment from some of the Maine lobster interests that the Canadian lobster imports depress their market and injure their own incomes, the fact is that today the health of the Maine industry is tied to continued substantial receipt of Canadian lobsters. No dealer of any size can now operate without some reliance upon these imported lobsters. Without this source of lobsters the expansion of markets and the use of the new distribution methods could not be considered. To meet even present demand would be impossible for the Maine fishery. In particular, the increased use of the fresh water tanks and pools throughout the United States puts a premium on an adequate and reasonably stable supply. This can only be assured with the help of the Canadian industry. Furthermore, the staggering of closed seasons in Canada complements the peak catch period in the summer of the Maine fishery and thus provides a greater degree of price and supply stability to the market than would otherwise be the case.¹³

13. This is not wholly true in the summer. The implication of this argument is that economies in marketing exist which given current institutional arrangements in the fishery could not be realized without the availability of the Canadian supply.

There is a Canadian cooperative that acts as agent in selling many of the Canadian fishermen's catch. The relationship, however, of the United States dealer to the Canadian fisherman are not notably different from those prevailing in the United States. Some of the larger United States dealers have Canadian employees who act as agents for them in buying lobsters. Other dealers buy from independent buyers in Canada, giving them a commission as they would do in the United States. United States dealers also own and/or operate lobster pounds in Canada.

Consumers tend to have an image of live lobsters as being Maine lobsters, and to this extent all live lobsters are commonly called Maine lobsters. Actually, Canadian lobsters are caught when the water is colder (due to the closed season), their shells are somewhat harder, and they are less subject to mortality in shipment. Also, in an ungraded lot of them, there are apt to be a greater percentage of jumbos and selects than in a comparable Maine assortment. These factors give a slight price differential in favor of Canadian lobsters which may run from five to ten cents in the New York wholesale market. The popular conception of Maine lobsters has probably helped to prevent this differential from becoming any greater. Nonetheless, it indicates the importance to Maine dealers of exercising proper grading and sorting of their lobsters before shipment to the market so that their own product need not suffer by comparison.

Aside from the imports of live lobster from Canada, there is no other important producing area that ships live lobsters to the New York market. The relatively small Massachusetts catch of 3+ million pounds annually is consumed in the local area. New Hampshire, Rhode Island, Connecticut and New York have each been producing considerably less than a million pounds a year. New Jersey, with the use of off-shore draggers, has been producing

close to a million pounds, but all of these states together are not able to supply their own local markets.

Since World War II, South African rock lobster tail has become a competitor of considerable importance for the live Maine lobster. Though this product has been imported to the United States for many years, only recently have imports of spiny or rock lobster grown to significant proportions.¹⁴

14. In 1940, one observer reported that, "the spiny lobster was not important enough from the point of view of importation or American production to detract measurably from the market areas for New England's lobsters." Nevertheless, Ackerman commented that the five year period, 1935-1940, had seen the substitution in many restaurants of South African lobster or crawfish for the Maine product because of its considerably lower price, sometimes only one-half as much as the price for Maine lobster. Ackerman's conclusion was that the "inferior taste and texture will very likely discourage widespread adoption on the general market." (The spiny rock lobster does not have the flavor of Maine lobster and is also a clawless animal.)*

*Edward A. Ackerman, New England's Fishing Industry (University of Chicago: 1941), p. 238.

In 1960, 144,000 pounds of lobsters were imported from South Africa.

TABLE I
IMPORTS OF LOBSTERS¹⁵
(Both Spiny and North Atlantic)

Source	1908		1900		1890
	<u>Lbs.</u>	<u>Value</u>	<u>Lbs.</u>	<u>Value</u>	<u>Value</u>
British Africa	136,000	\$23,000	144,000	\$11,000	
Canada	8,064,000	1,275,000	7,329,000	915,000	\$491,000
Newfound- land & Labrador	5,300	1,500	17,000	3,400	76,000
All other sources	7,700	1,800	7,100	1,400	800
TOTAL	8,213,000	\$1,401,300	7,497,100	\$930,800	\$567,800

15. Fisheries of the United States, 1908, Department of Commerce and Labor, U.S. Bureau of the Census Special Reports (Washington: 1911), p. 62.

The improvements in freezing techniques during World War II made possible the rapid extension of the marketing of rock lobsters in the United States. (Previous to World War II much of the South African lobster went to France in cans.) After the war, heavy shipment of frozen lobster tail was begun to the United States.

TABLE II
IMPORTS OF FROZEN LOBSTER TAIL FROM THE UNION OF
SOUTH AFRICA¹⁶

<u>Year</u>	<u>Pounds</u>	<u>Value</u>
1947	2,236,780	\$1,485,076
1948	2,657,178	1,986,872
1949	2,384,847	1,873,905
1950	4,293,960	2,794,860
1951	5,443,855	3,824,835
1952	5,172,713	4,196,545
1953	5,788,847	4,865,920
1954	3,749,832	3,130,530
1955	5,582,344	4,723,661
1956	7,024,524	6,024,687
1957	6,908,185	6,446,906
1958	6,362,860	6,800,000

16. FT-110-U.S. Imports of Merchandise for Consumption, Commodity by Country of Origin, Bureau of Census, Department of Commerce.

A few other countries also export spiny lobster to the United States although the Union of South Africa is by far the largest exporter.

TABLE III

IMPORTS OF FROZEN SPINY LOBSTER TAIL¹⁷
(In thousands of pounds, six largest exporters)

<u>Country</u>	<u>1955</u>	<u>1957</u>
Union of South Africa	5,582	6,908
Australia	4,980	5,369
Cuba	3,463	4,249
New Zealand	3,171	4,204
Mexico	2,478	2,159
Bahamas	2,124	1,964

17. FT-110-U.S. Imports of Merchandise for Consumption, Commodity by Country of Origin, Bureau of Census, Department of Commerce and U.S. Imports of Selected Fishing Products and Comparisons, United States Department of the Interior, Fish & Wildlife Service.

In recent years, as imports have been increasing, there has been concern about competition from the South African lobster. In the summer of 1958 a bill was introduced in Congress which intended to restrict the use of the word "lobster" to "Homarus americanus" (which is found only in the Atlantic waters contiguous to the North American coast). The bill was aimed at curbing the sale of South African lobster tail but was not enacted.

At the time it was argued before Congress by the Importers Trade Association that the South African product had always been advertised as "rock lobster" and was a product completely differentiated from the Maine lobster.¹⁸

18. Hearings on S. 237, Committee on Interstate and Foreign Commerce, U.S. Senate, 85th Congress, 2nd Session (Washington: 1958), p. 48.

The importing association claimed in their presentation that frozen spiny lobsters were not competitive with the Maine product because the price of spiny lobster was higher. However, it is not clear from the data presented that the price per ounce was higher. In fact, it appears to have been lower.

Though the product may be differentiated from the Maine lobster in the consumer's mind, the significance of such differentiation is questionable.

The opportunity to use the word "lobster" in the promotion of the rock lobsters has no doubt improved sales and was very helpful in first establishing a market for the African product. However, the fact that the South African Lobster Association is spending \$800,000 a year in advertising and promoting rock lobster is in marked contrast with the absence of any such program by Maine interests.¹⁹

19. Ibid., p. 47.

Mr. Jackson, General Manager of the National Fisheries Institute, Inc., has expressed the opinion that the South African's use of the word "lobster" could be helpful to Maine. Since this product has been advertised widely in markets in the middle west, Mr. Jackson feels that the North Atlantic lobster industry, "if they were inclined to do so," could now enter those Middle West markets and take advantage of the lobster advertising of South Africa.²⁰

20. Ibid.

On net balance, the importation of other species does not seem to have had any adverse effect on the marketing of Maine lobsters. If lobster dealers adopt vigorous selling policies, it seems clear that their long-run problem will be how to obtain enough lobsters to meet demand.

QUANTITATIVE ASPECTS OF THE FISHERY

Secular changes in output

We have discussed elsewhere the changes in output in the late nineteenth and early twentieth centuries.¹ As we indicated, there is no really

1. Chapters I and II.

satisfactory explanation of the decline in production from the latter years of the nineteenth century to the beginning of the third decade of the twentieth century.

One hypothesis that has been advanced is that the fishing grounds were initially stocked with a dense, aged population of lobsters. The accumulation of large lobsters was the basis for the fishery for a number of years. As production increased, the density of the original population declined, and its age and size distribution changed, until eventually a rough equilibrium between addition to supply and fishing withdrawals was reached.²

2. The history of Canadian production is similar to that of the United States (Maine). See D.G. Wilder, The Lobster Fishery of the Southern Gulf of St. Lawrence, Fisheries Research Board of Canada, General Series Circular No. 24 (June, 1954).

The removal of the larger lobsters probably created a greater food supply and reduced predation by the older on the younger lobsters, so that the equilibrium eventually reached was at a higher level than it would have been if there had not been a change in the age distribution of the population.

In the late 1920's and throughout the 1930's, the fishery suffered from

Chart 1





Chart 2
MAINE LOBSTER AND REDFISH LANDINGS,
1939-1958

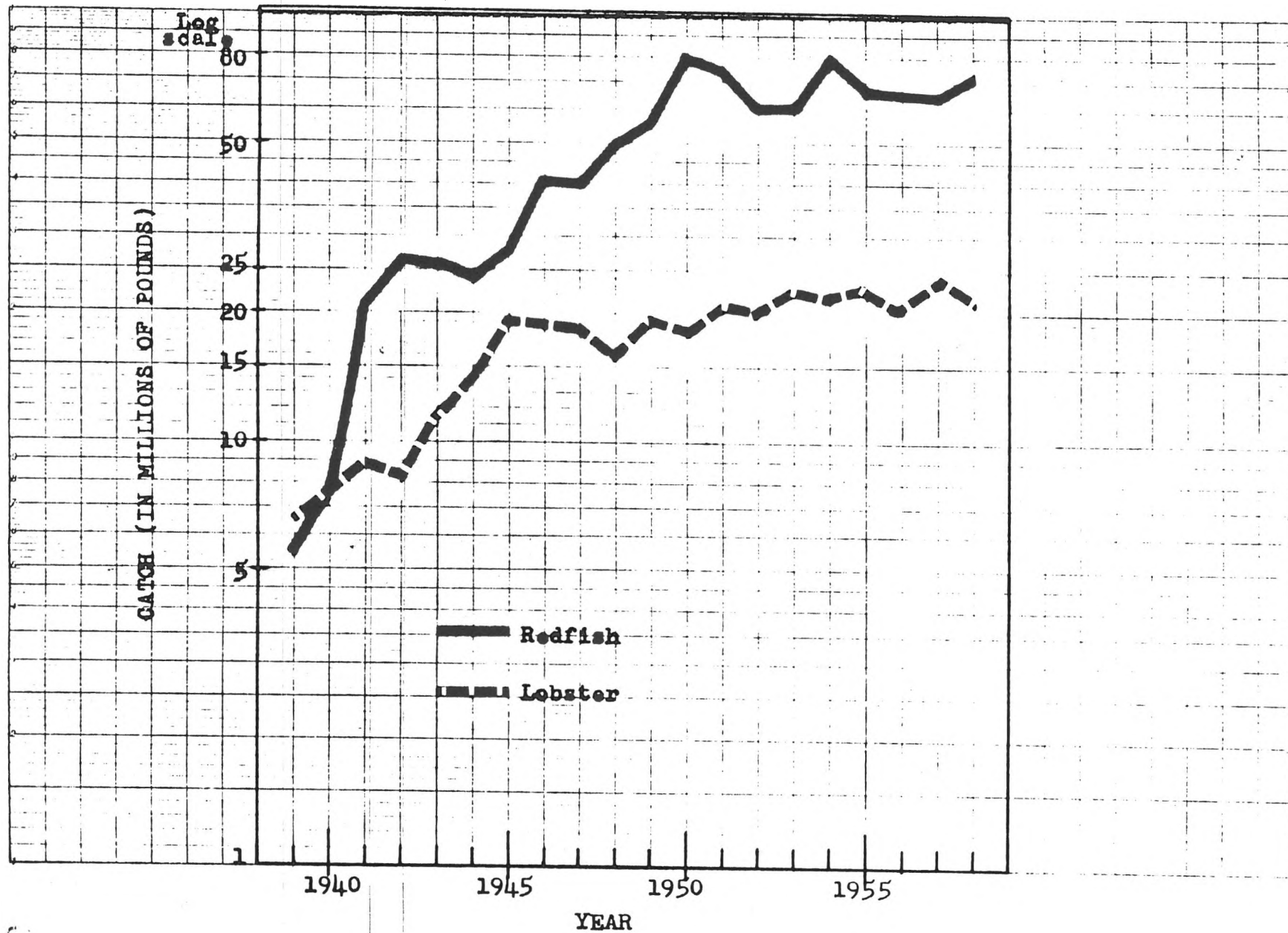
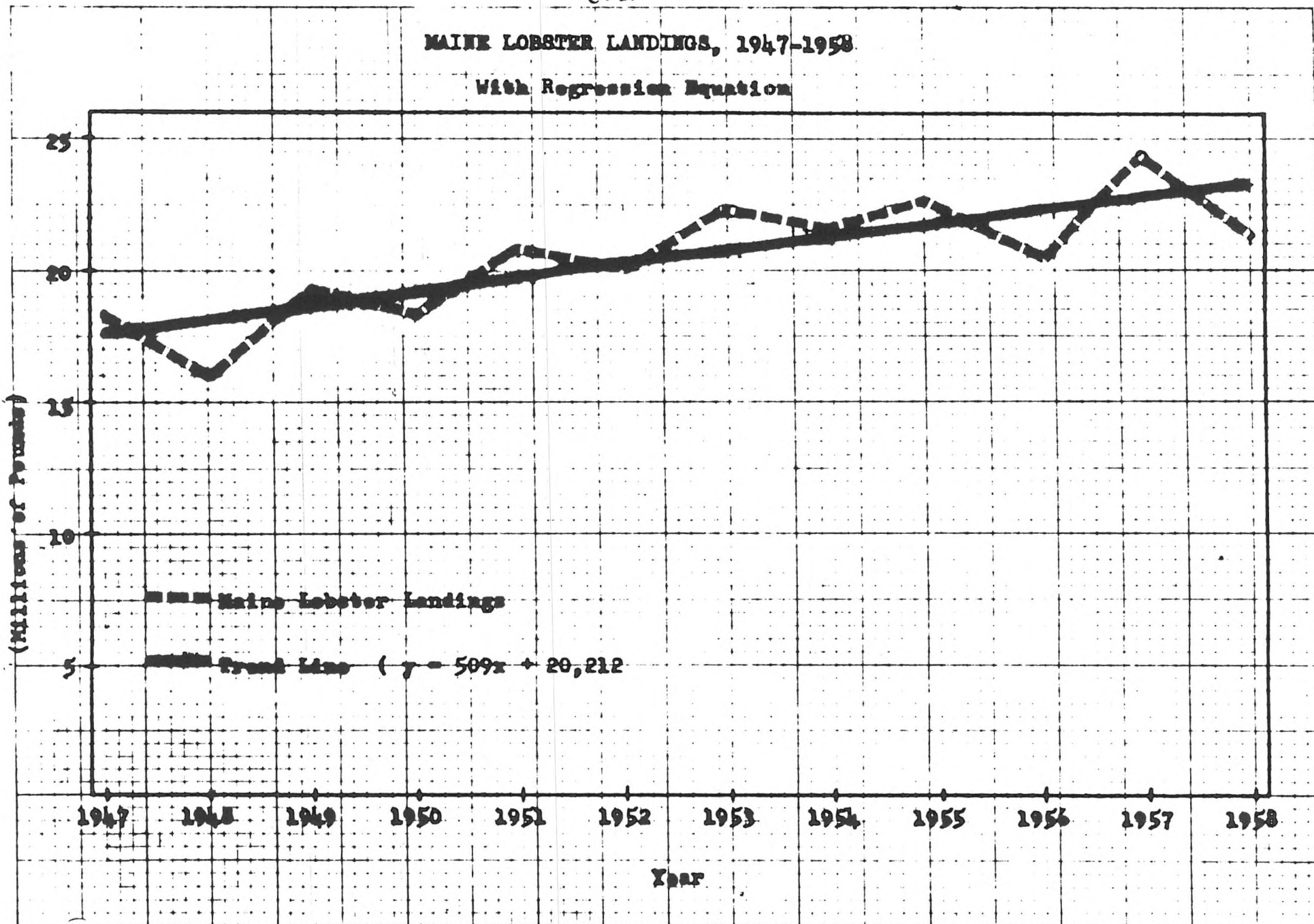


chart 3

Maine Lobster Landings



economic depression. The depression in the Maine fishery had several causes. Most important in the late 1920's was the increased penetration of the American market by Canadian imports. At that time with the American market demand for lobster relatively constant, the increased supply had adverse price effects which hurt the American fishery. These conditions were aggravated by the general economic depression of the 1930's. There are indications that the price cost structure was adverse to any extension of fishing activity.³

3. The price of gasoline and the availability of bait were two limiting factors. (Redfish were not available in quantity until after 1938.)

The result of these conditions was that Maine output ranged from above five to below eight million pounds from 1919 to 1940. Between 1940 and 1947, output increased 138 per cent or almost twelve million pounds. Since 1947 only once (1948) has it been below eighteen million pounds and from 1951 through today it has been in excess of twenty million. The peak year was 1957 when over twenty-four million pounds were produced.

It is possible to enumerate the forces that in our opinion contributed to this sudden increase in production during the 1940-1947 period. However, for several reasons we do not feel that the data presented should be interpreted as more than a tentative hypothesis about the nature of the change.

Probably the major factor in expansion of output was an increase in the intensity of fishing. This increased intensity had a variety of causes. Initially, production increased in response to marked increases in price. This encouraged the existing group of fishermen to extend their operations and also attracted entry. The most obvious indication of extension of the fishery was in the growth of the winter fishery. From 1940 to 1947 the winter fishery increased over 200 per cent.⁴

4. If 1939 is used as a base, the relative growth in the winter fishery is much greater. On an average basis from 1939 to the early 1950's, the winter fishery grew by over 600 per cent, about three times the percentage growth in the summer and fall fishery.

The winter and spring fishery is carried on offshore, i.e. outside the bays, inlets, and coves along the coast, where the water is deeper and in winter relatively warmer. Offshore winter fishing was not new in 1940, but as the catch data indicate, it was rapidly expanded.⁵

5. In the 1903-1904 Biennial Report of the Commissioner of Sea and Shore Fisheries (p. 33), the Commissioner reported how a price increase had caused an extension of the fishery into the winter months and thereby made possible the exploitation of new offshore, ten to fifteen miles, fishing grounds. He estimated that this procedure had doubled the area available to fishermen.

In part the rapid extension of the fishery, especially in the winter months, was made possible by the qualitative improvements in equipment, especially boats and motors, that took place over the years. Another important factor was the decision of the O.P.A. to classify the lobster as a luxury item not subject to price control. Furthermore, since lobster fishing was food production, it was possible for the men to freely obtain equipment (motors) and gasoline as a contribution to defense. These circumstances, i.e. the control of prices except lobster prices and readily available supplies, shifted the price cost relationship heavily in favor of the fishermen after 1940 and made an important contribution to the stepped up intensity of fishing effort.

These factors, plus entry, are advanced as the primary causes of the increase in output. What happened was that the fishery was extended geographically, primarily offshore, and at the same time a much more intensive

inshore fishery was carried on. The work was done by more fishermen who were better equipped. A further assumption of this hypothesis is that the change in output could have occurred at any time. In other words, it was an economic not biological phenomenon. At whatever time the intensity of the fishing was increased, the biological population was available to provide greater output. This assumes that there were no significant shifts in the lobster population, or that if there were shifts, they took place at a level beyond that reached by the fishing effort.

However, as noted above, this is a tentative hypothesis. Many fishermen feel strongly that there have been wide swings in biological abundance. Furthermore, Taylor and others have suggested that the secular upward movement in water temperature since the middle of the nineteenth century has created a different marine environment in the Gulf of Maine:

Such a widespread increase in lobster landings suggests an environmental change making possible the survival of greater numbers of lobsters to catchable sizes. Tagging experiments in Maine and length-frequency data collected by the Fish and Wildlife Service over the period 1939 to 1947 indicate that mortality rates remained very constant over the period of increase so that the increased catch was caused by an increase in abundance rather than by an increase in the amount of fishing.⁶

6. Clyde C. Taylor, Henry B. Bigelow, and Herbert W. Graham, Climatic Trends and the Distribution of Marine Animals in New England, U.S. Department of the Interior, Fish and Wildlife Service, Fishery Bulletin 115, Vol. 57 (Washington: 1957), p. 325.

The water temperature hypothesis may be important but the evidence presented by Taylor is anything but conclusive on this score. Another environmental change that may be important but which at the present level of biological knowledge is simply an idea is the effect of the eel grass disease. In the early 1930's, much of the eel grass along the coast became

diseased and subsequently died out.⁷ This grass had been one of the spawning areas of groundfish, especially flounders. (The disappearance

7. This was a very general phenomenon which occurred in Europe as well as the United States.

of the eel grass forced the flounders to seek other spawning grounds.) Since the groundfish were predators on small lobsters, the removal of this predation may have influenced the abundance of the adult lobster population. Additional hypotheses about the sources of biological variation in supply of any animal whose life cycle is as complex as a lobster's are virtually infinite, so that while hypotheses are plentiful, the real evidence on biological population variation is scarce. In this circumstance, it seems most reasonable to assume that the marked increase in output in the 1940's was due to the discovery of new populations and to the more intensive exploitation of older, already utilized, populations.

The performance of the Canadian fishery during the 1940's is not inconsistent with this position. Canadian output increased by about five million pounds from 1940 to 1947, or nineteen per cent. The low level of this increase, i.e. Maine output increased twice as much and almost 140 per cent, suggests that if there were a fundamental biological shift it was limited to the Maine coast, and this seems unlikely.⁸

8. On an average basis Canadian output increased roughly ten to twelve million pounds from the late 1930's to the early 1950's.

Since the end of the 1940's, Maine production has moved in a fairly narrow range, from 18.4 million pounds in 1950 to 24.4 million pounds in

1957. (From 1951 to 1958 the range is 4.4 million pounds.) The stability of output in recent years suggests that there is temporarily at least an equilibrium between fishing effort and biological abundance within those populations currently being exploited.

Once again we find that inadequate biological information makes hypothesizing about long-run future movements in output hazardous. If our hypothesis about the essentially economic basis for the previous expansion of the fishery is correct, then we could anticipate greater output in the future if economic conditions warranted it. Suppose that the current annual price level of about fifty cents per pound were to double in five years or less. Could we expect output to increase from twenty to forty million pounds in Maine and similarly in Canada, i.e. is it possible to increase the intensity of fishing activity without rapidly diminishing returns? The answer to this question is indeterminate.

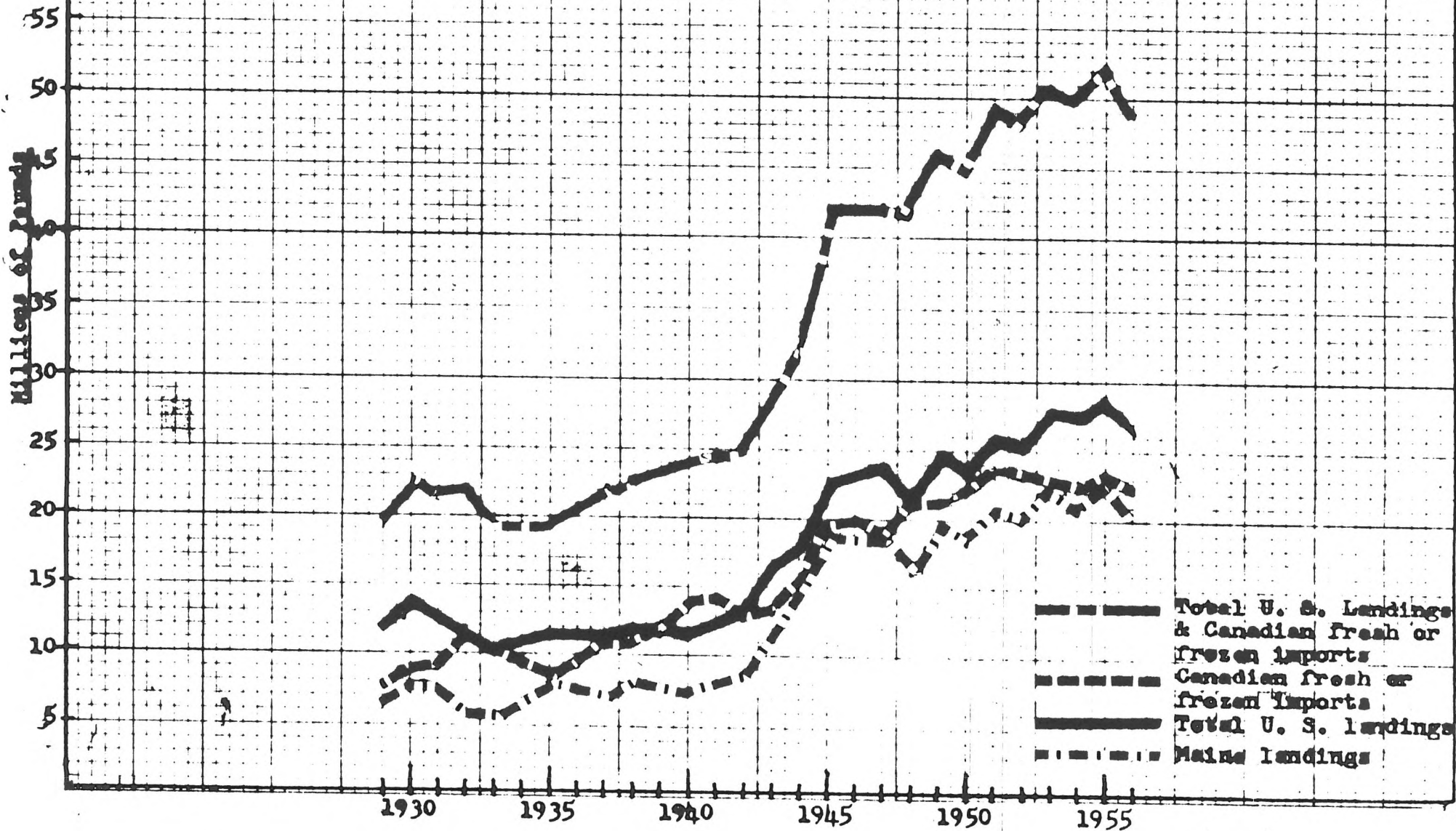
It is clear from population studies that there can be no increase in intensity in certain areas. In these areas, Sebasco for example, the catch consists almost exclusively of what comes into the fishery (legal size) by moulting. However, the yield from these areas might be increased by better management of fishing activity and environmental conditions. This leaves the question of the possibility of extension of the fishery into new and/or currently underexploited populations. Sharp increases in price might make possible and profitable offshore fishing using new techniques and equipment that are now too costly to employ. And price increases might also motivate fishermen using existing equipment to extend their operations to areas which are today ignored or only occasionally fished.

In any event it seems possible to expand output in the future if the price is adequate. But there obviously is a limit to output and before any

chart 5

U. S. "LIVE" LOBSTER MARKET

1929-1956



T-54 1

LOBSTER PRODUCTION AND CANADIAN IMPORTS
1929 - 1956

(thousands of pounds)

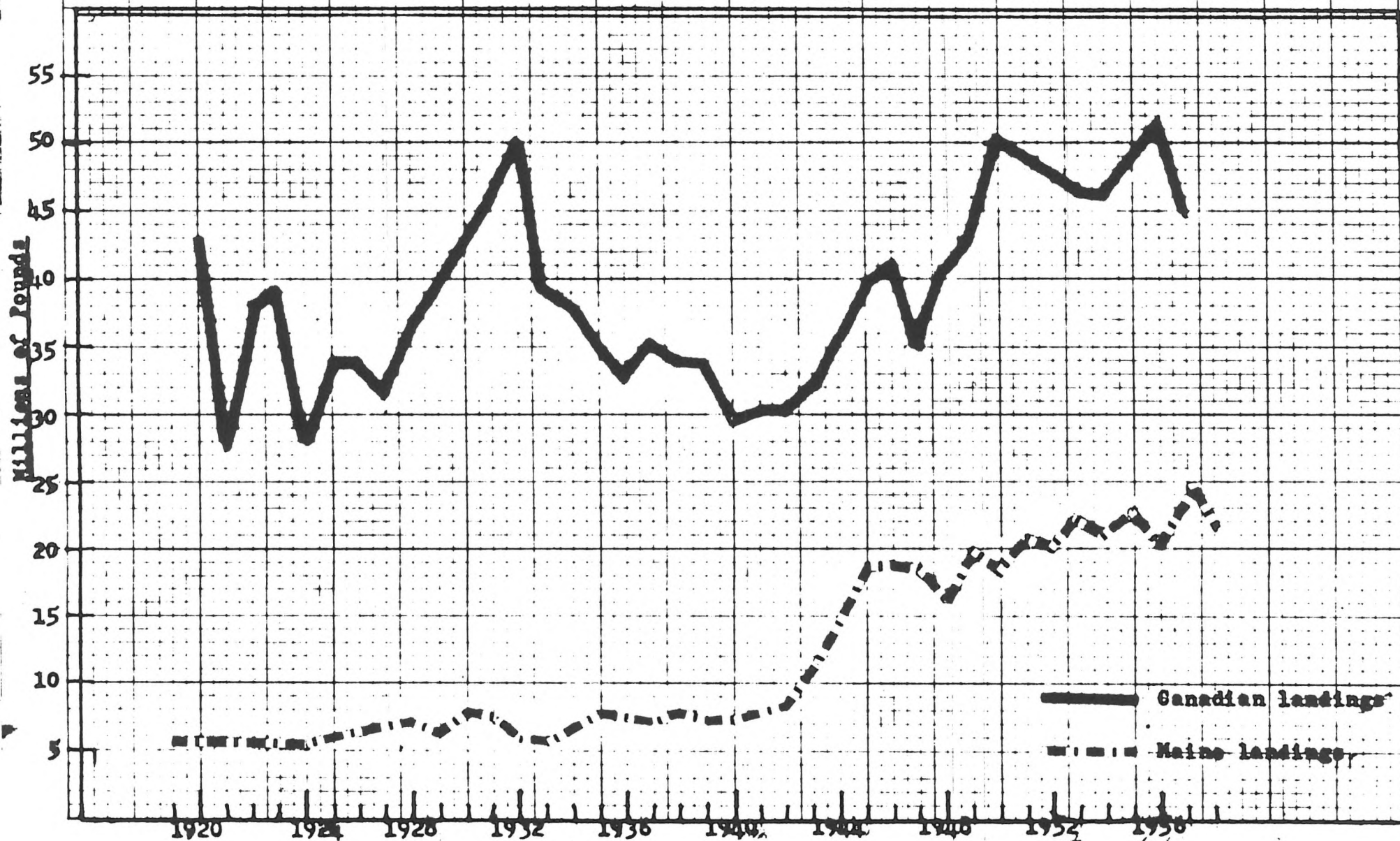
Year	U.S. Landings	Canadian and U.S. Landings	U.S. Landings and Canadian Imports (1)	U.S. Landings and Not Canned Canadian Imports
1929	11,747	51,792	25,020	19,298
1930	13,916	57,044	27,974	22,759
1931	12,461	58,426	27,979	21,294
1932	11,157	61,505	27,197	22,088
1933	9,812	49,097	25,551	19,718
1935	11,495	45,910	22,423	19,859
1937	11,576	46,712	24,720	22,287
1938	11,982	46,306	24,790	22,735
1939	11,984	46,207	26,183	23,530
1940	11,759	41,238	30,303	24,335
1942	12,299	42,461	29,467	24,801
1943	16,424	48,433	36,506	29,236
1944	17,929	53,572	42,536	33,109
1945	22,727	62,237	50,717	42,412
1947	23,925	58,984	46,613	42,326
1948	20,985	61,843	47,999	41,835
1949	24,654	67,864	51,460	46,017
1950	23,194	73,334	53,278	45,240
1951	25,943	74,911	55,495	49,501
1952	25,029	72,681	56,155	48,226
1953	28,102	74,620	55,456	50,713
1954	27,468	73,571	55,694	49,936
1955	28,939	77,898	60,356	51,901
1956	26,511	78,119	57,550	48,995
1957	30,152	74,774	61,185	52,370

(1) Canned lobster converted to live weight by multiplying by a factor of 4.0.

chart 4.

CANADIAN AND MAINE LOBSTER PRODUCTION

1919-1957



additional pressure is put on the lobster population, there should be a serious attempt to learn more about the possibility of population management.

The total market supply of live lobsters is approximately the sum of live Canadian imports and Maine production.⁹ The total supply ran under

9. This is only an approximation because a small fraction of the Maine catch goes into the summer retail market. This is true of most of the rest of the United States catch.

twenty million pounds in the 1920's and throughout most of the 1930's. Then, largely under the impetus of the expansion of the Maine fishery, market supply rose to forty million pounds by the middle of the 1940's and it has remained slightly above this figure throughout the 1950's.¹⁰

10. The reader should keep in mind that the meat yield is much lower. For a shedder the ratio of live weight to meat may run as high as 7:1; for a hard-shelled lobster, 4:1.

In the 1930's Canadian imports, not canned, ran several million pounds higher than the amount of the Maine catch. This situation changed in the 1940's and for the last few years, market supply has been about equally divided between Maine and Canada. Since 1951 Canadian imports and Maine landings have averaged about twenty-two million pounds each. As one might expect, the import figures appear to have slightly greater stability than do the Maine landings. This is because Canadian imports, not canned, are a little less than half the total Canadian landings, which allows the impact of natural fluctuations in landings to be adjusted.

If the price of live lobsters should rise, it would be possible for the Canadians to shift at least part of what is currently canned to the live market

thereby increasing total supply. It also appears that, based on the size distribution of the Canadian catch, further extension of the Canadian fishery is possible, although this is by no means certain.¹¹

11. If all northeastern United States production and Canadian imports are grouped together, total market supply in the 1950's runs between forty-five and fifty million pounds.

Long and short run price movements

Long run price movements have been plotted on both a monetary and a real basis, i.e. adjusted by the cost of living index. (See Chart)

The highest annual average price in the 1920's was thirty-two cents a pound in 1924. This was also the highest price in real terms during the decade (based on the scanty data that are available). However, the real price recorded in 1924 (forty-four cents) is considerably below what the real price had been in the period 1913-1916. From 1924 through the 1930's both the money and real prices fell more or less continually. (Actually, it appears that the real price of lobsters fell more or less continually from the 1913-1916 period to 1939.) By 1939 the money price was half of what it had been in 1924, or sixteen cents, while the real price had declined by eighteen cents a pound to twenty-six cents. For the years 1932 to 1940 the average money price was only eighteen cents a pound.

The downward drift of prices from the early 1920's to the end of the 1930's is an important indicator of adverse economic pressure on the fishery. If we assume no changes in the productivity of the fishermen and no substantial reduction in the number of fishermen over this period, falling prices meant declining incomes. In part in the 1930's, this price effect was offset by the decline in the general price level, i.e. the effect on the price-cost relationship was not as severe as the price decline would indicate. However, the

offset was not complete, and therefore the lobstermen experienced almost twenty years of declining income.¹²

12. The Bureau of Labor Statistics cost of living index fell by nineteen per cent from 1929 to 1939, while the price of lobsters declined forty-seven per cent in the same period. Keep in mind also that American lobster output did not change significantly from the 1920's to the 1930's.

This price level effect certainly helps explain the level of output and the general stagnation of the fishery prior to World War II.¹³ It

13. Agriculture also suffered from declining prices during this period, from the middle 1920's to the end of the 1930's.

also illustrates the dependence of the fishery on the general prosperity of the country, although undoubtedly better marketing techniques would have mitigated the downward price pressure.

The average price for the period 1941-1947 was thirty cents a pound, up twelve cents from the average price of the 1930's. In 1945 the average annual price reached a peak of forty cents a pound. At the same time, the price adjusted for changes in cost of living, the real price, was fifty-two cents a pound, an increase of twenty-six cents in six years.

Lobster prices, in money terms, have not increased with the general rise in prices in the post war period, and therefore, since the end of the war, the real price has tended to fall. The low in the real price was thirty-one cents in 1957. (However, 1958 saw a sharp increase.) The money price has remained close to post war levels, usually slightly under forty cents a pound.

In part the falling real price of lobsters may have been offset by increased productivity, but it is clear that constant money prices and falling

real prices have hurt the fishermen. The effect of price movements on the fishermen is perhaps illustrated by the following chain of events. In 1954 and 1955 the men were increasingly restive about conditions in the fishery. This attitude culminated in the formation of the Maine Lobstermen's Association and its initial call for action against the dealers. The sharp rise in price in 1956 temporarily removed some of the pressure for action against what the men considered the primary cause of their grievances. When, however, 1956 was followed by a very sharp price decline, the existing organization was eager to take action and the result was the legal battle of 1957.

It should be pointed out that the dealers do not have the same stake in higher prices as the fishermen. The dealers' primary price concern is for low summer and early fall prices and for wide annual swings in price.

An index number of lobster and also other fish prices has been constructed to make possible more detailed examination of price movements in the period since 1950.¹⁴

14. The monthly and annual prices used in this index are obtained by dividing the monthly or annual value of landings by the total number of pounds landed. The prices are then in terms of dollars per pound. The formula used for the index is the regular Laspeyres formula:

$$I = \frac{P_i Q_o}{P_o Q_o} = \left(\frac{P_i}{P_o} \right) \left(\frac{P_o Q_o}{P_o Q_o} \right)$$

where: P_i is the price in the current period

P_o is the price in the base period

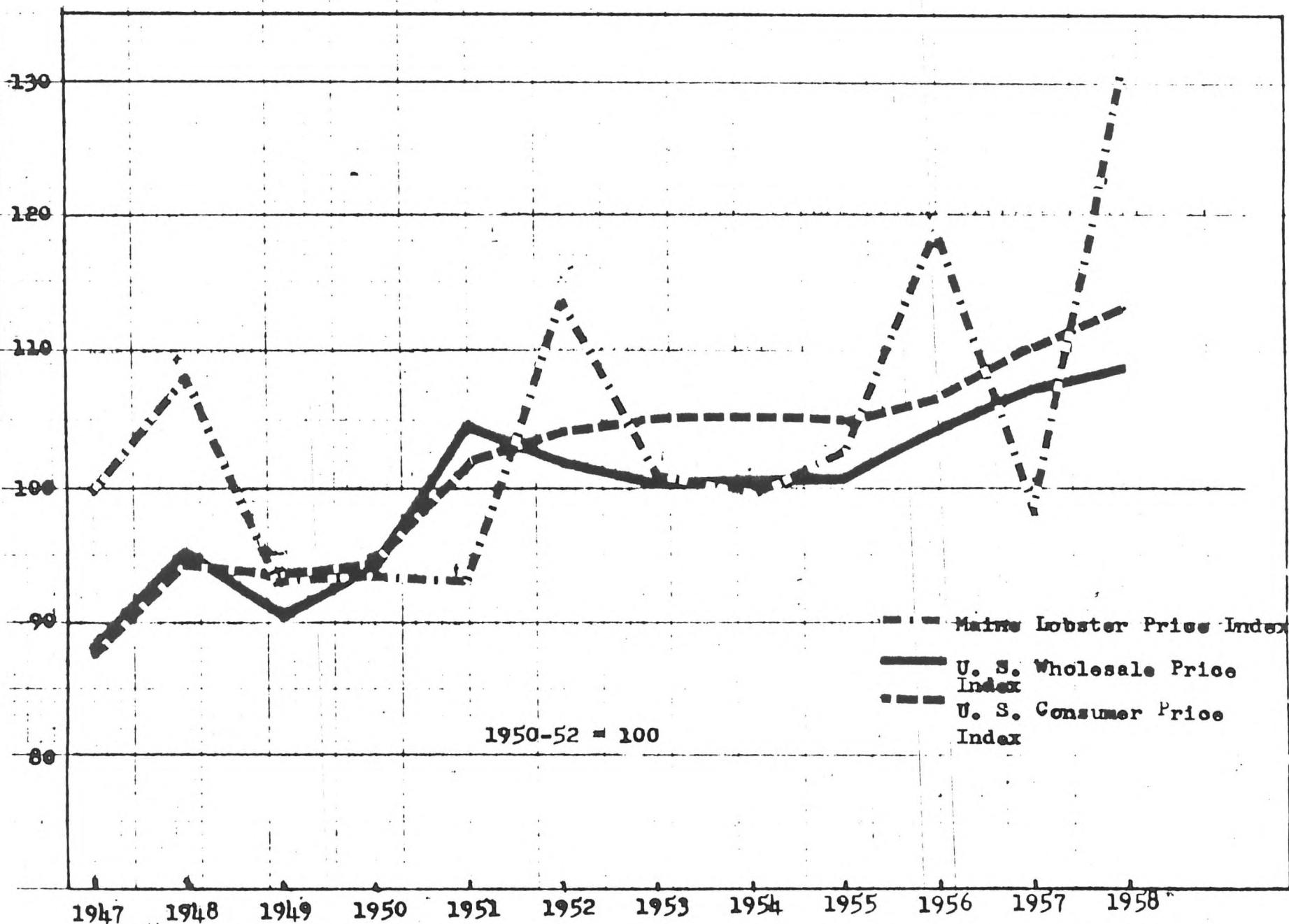
Q_o is the quantity weight in the base period

The index of "real" prices is obtained by simply dividing the current price index by the U.S. Department of Commerce Wholesale Price Index, after putting the Wholesale Price Index on a 1950-52 = 100 basis by dividing the 1947-49 = 100 values by the 1950-52 average of that index.

The source of the data used is the annual and monthly summary of "Maine Landings" published by the Department of Sea and Shore Fisheries, Augusta, Maine.

Chart 6

MAINE LOBSTER PRICE INDEX, U.S. WHOLESALE PRICE INDEX,
AND THE U.S. CONSUMER PRICE INDEX, 1947-58.



100

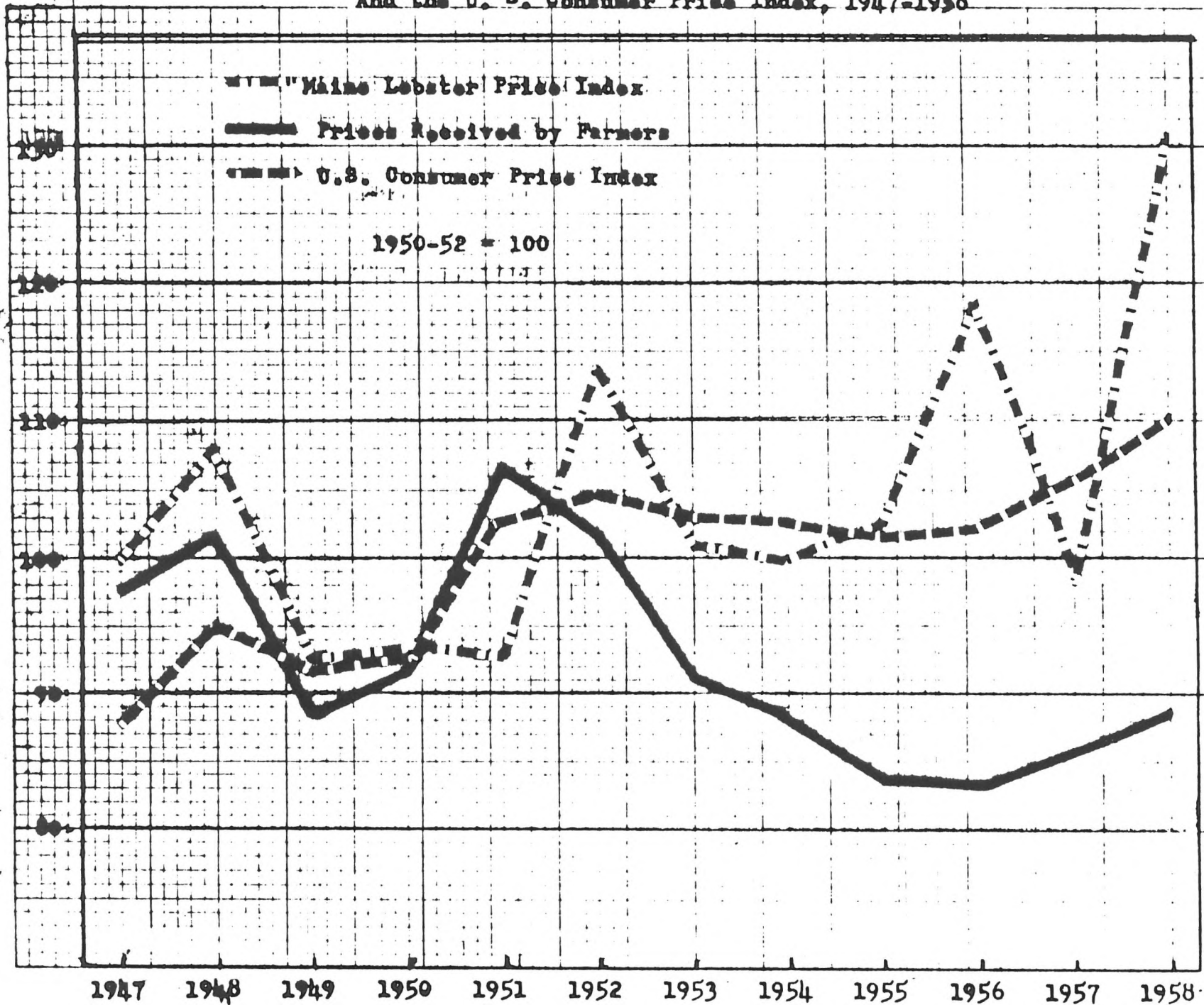
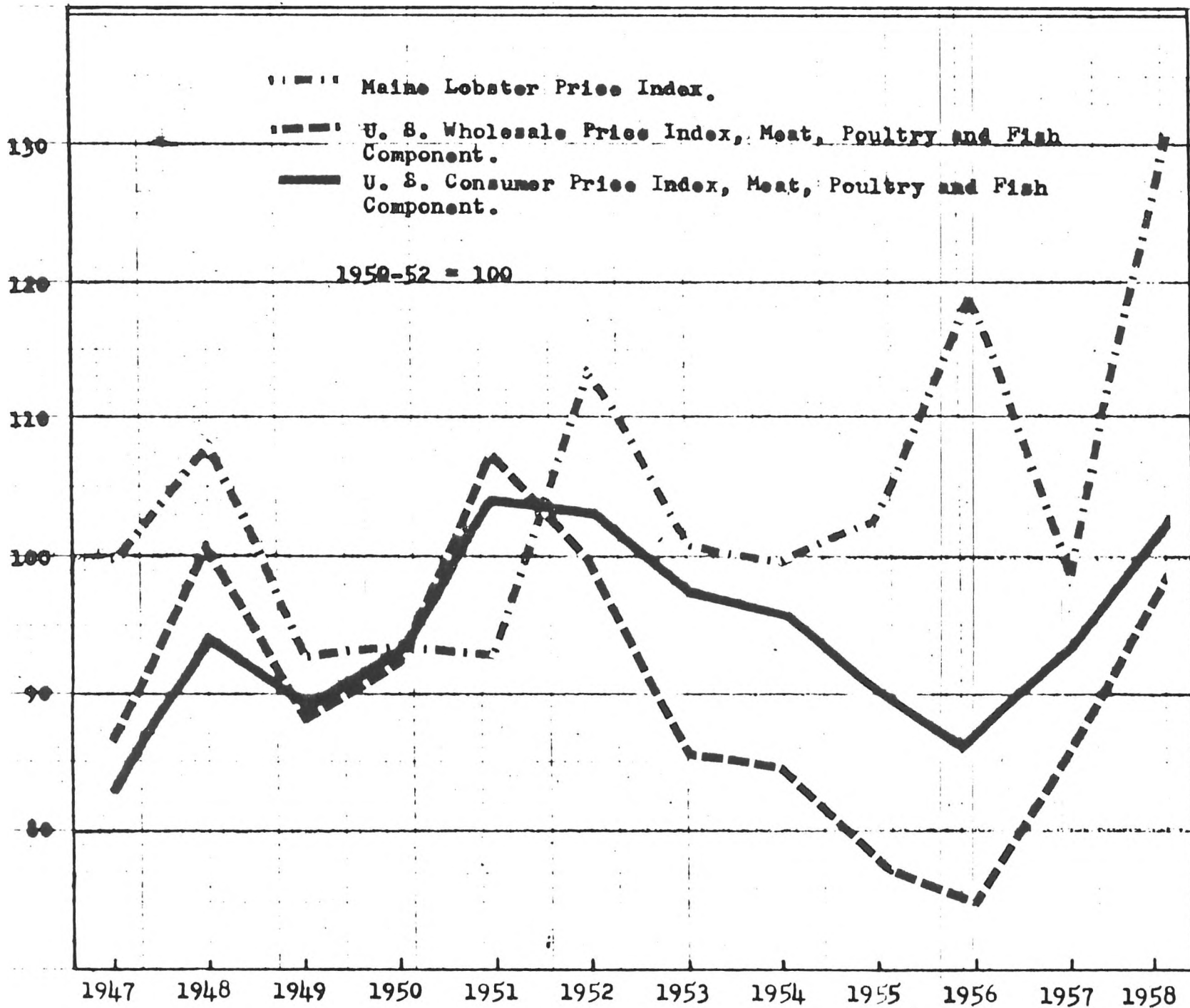


Chart 8

PRICE INDICES FOR LOBSTER; AND MEAT, POULTRY, AND FISH,
WHOLESALE AND RETAIL, 1947-1958



The striking characteristic of lobster prices is their instability. For example, from 1957 to 1958 the average annual price increased thirty-three points, while from 1956 to 1957 it declined twenty points. While price variations of this magnitude do not occur all the time, they occur often enough to suggest that market forces are the primary determinant of price.¹⁵

15. The amplitude of the annual swings in price is partially dependent on the nature of the seasonal price movements. Therefore, we will discuss the basis for these price movements when we analyze the seasonal pattern.

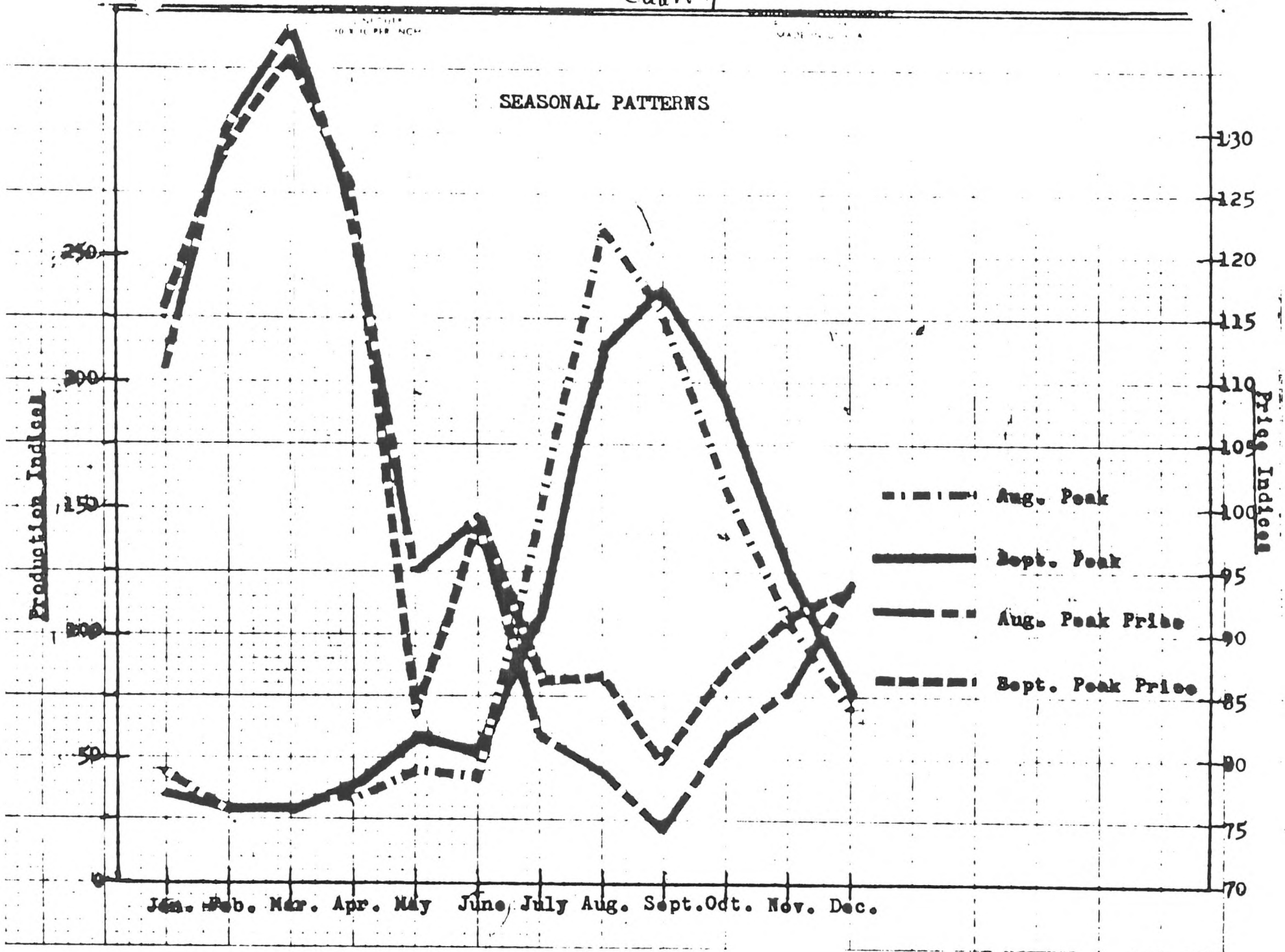
When the index number of lobster prices is compared with national indexes of the cost of living and wholesale prices, it appears that lobster prices have on four occasions (1948, 1952, 1956, and 1958) shown much greater increases than the national index numbers. Twice in the post war period (1951 and 1957) lobster prices have failed to keep up with either of the other two indexes. Since the early 1950's, the value of the lobster price index has been relatively higher than national indexes of poultry, meat, and fish at both the wholesale and retail levels. Also, since the early 1950's the lobster price index has been consistently above the level of prices received by farmers.

It is necessary, however, to balance the general level of lobster prices against the uncertainty created by their instability. Price declines of the magnitude of 1948-49, 1952-53, and 1956-57, and the instability since 1955 cannot help but create uncertainty and confusion in the fishery.

Seasonal variation in production and price

Seasonal variations in output are expensive in any type of enterprise. Marked changes in the flow of output caused overhead costs to increase

Chart 9



rapidly. These increased costs take several forms, the most obvious being those associated with the additional money capital and equipment needed to handle the peak loads.¹⁶

16. For a detailed exposition of these costs in a fishery, see J.A. Crutchfield, "Common Property Resources and Factor Allocation," The Canadian Journal of Economics and Political Science (August, 1956), pp. 294 ff.

In addition to higher costs, the concentration of output in a short time period has, in the case of fisheries where the product is highly perishable, an adverse price effect.¹⁷ This is clearly the case in the lobster

17. This adverse effect is felt essentially by the primary producer who must sell his catch at once, not by subsequent buyers in the chain of distribution.

fishery where the effect of seasonal variation on price is one of the primary causes of an inadequate economic performance by the fishery.

The seasonal pattern is for a very heavy concentration of the catch to take place in the late summer and early fall. The reasons for this are interrelated. When the inshore waters begin to warm in the late spring and early summer, the inshore lobster populations become more active and depending on the location along the coast and the water temperature, i.e. how regularly temperatures rise, they start to shed. If temperatures are high, shedding may be pronounced on the western end of the coast and in Casco Bay by the middle of June. However, in colder years the shedding may be very spotty and take all summer and part of the fall to cover the entire coast.

Warm temperatures also imply not only more active lobsters, but also better fishing weather, so that it is likely that the fishing intensity is greater in those years with higher average temperatures than in colder weather.¹⁸

18. Water temperature also effects the growth rate of lobsters and since certain sizes of lobsters seem to be more catchable than others, output may vary for this reason.

Better weather means less set overfishing and the men may set out more traps, especially if there is a good June and early July. In addition, some entry may take place on the assumption that the good weather will hold all summer.

The concentration of the catch is also affected by weather conditions which may or may not be closely connected with warm or colder water. For example, severe storms, hurricanes in August, September, and October, may destroy equipment and reduce the intensity of fishing activity, or an unusual amount of local coastal fog in the summer may hamper the men. All of these and other forces affect the human fishing effort.¹⁹

19. Obviously, another set of short run forces affect the catchability of lobsters, but of these only temperature is measurable.

The extreme concentration of the catch in the late summer is indicated in Chart 9. Two months, August and September, have accounted for from between thirty-four and forty-five per cent of the entire year's catch since 1947. The period August through October has included from forty-one to sixty per cent of the year's total catch with the average (median) above fifty-two per cent. If we extend the period to include July through October, we find that from fifty-four to seventy per cent, usually about two-thirds, of the catch is landed in these four months.

The seasonal pattern does not appear to have been shifting or changing over the post war period.²⁰ Rather, based on the post war data, there

20. Up until the last few years, this did not seem to be the case, i.e. there was a definite progression in the seasonal pattern from the late 1940's to the 1950's with the break at 1950. This progression gave the impression of increasing seasonal concentration. However, since 1956 the seasonal pattern has shifted back and forth between the two seasonal patterns discussed below.

appear to be two seasonal patterns in the fishery. In one, August is the peak month of production and in the other, September. The peak month, regardless of whether it is August or September, usually accounts for about twenty per cent of the annual total. However, the seasonal pattern based on August as a peak is somewhat more concentrated than the pattern based on September, so that when there was a shift forward from September peaks to August peaks, as in the early 1950's, it appeared that the seasonal concentration of the catch was increasing. From 1955 to 1958 the peak month shifted back and forth each year.

TABLE 2
MONTH OF GREATEST OUTPUT

<u>Year</u>	<u>Peak Month of Production</u>
1947	September
1948	September
1949	September
1950	August-September*
1951	August
1952	August
1953	August
1954	August
1955	August
1956	September
1957	August
1958	September

*Catch was essentially
the same both months

There is a relationship between water temperature and the timing of peak production. The annual mean water temperature in years when the peak

is in August is 50.3 degrees (F). In the years when the peak occurs in September, the annual average temperature is 48.1 degrees (F).²¹

21. Based on the average temperature for the January-July period, August peak years averaged 47.5 degrees (F) while September years were 45.2 degrees (F).

Years with the earlier peak are also associated with larger annual landings. The average annual landings for the period 1947-1958 when August was the peak month was 21,462,000 pounds and when September was the peak, it was 18,952,000 pounds. However, since there is some upward secular movement in total output and total output is influenced by a variety of factors, the difference in total catch as associated with the temperature difference may not be significant.²²

22. For example, there were two hurricanes in 1954, the first on August 31 (Carol) and the second on September 11 (Edna). The storms account in part for the sharp drop in September output in that year.

The most important effect of the difference in the two seasonal patterns is in their price effects. When the peak in production shifts into August, the price drops sooner and lower than when the largest output is delayed until September. Furthermore, when the price falls early in the season, it tends to remain low throughout the entire fall period. This seriously affects the fisherman's income as the table illustrates.

The sharp drop in income associated with the peaking of production in August is primarily the result of the heavy concentration of shedder lobsters in the catch.²³ When the shedders come in early and in large numbers, the price falls due to the increase in production and also the deterioration

TABLE 3
THE EFFECT OF SEASONAL VARIATION ON THE
VALUE OF THE CATCH

Year	Month of Peak Production	Annual Production (millions of pounds)	Value of Catch (millions of dollars)
1955	August	22.7	\$8.7
1956	September	20.6	9.1
1957	August	24.4	8.9
1958	September	21.3	10.4

23. Shedders have greater catchability than hard shelled lobsters. After the lobster has moulted, he is hungry and more active.

in the quality of the lobsters, i.e. with shedders there are more damaged and weak lobsters. This qualitative decline is translated into lower prices in the wholesale markets and also along the coast. A substantial portion of the shedder catch is, of course, pounded when the price is low. But the withdrawal of part of the supply is not enough to prevent adverse price results.

Dow and others have estimated that total storage capacity in Maine is slightly over six million pounds.²⁴ They further suggest an annual fall

24. R. Dow, D. Harriman, L. Scattergood, "The Role of Holding Pounds in the Maine Lobster Industry," Commercial Fisheries Review (May, 1959), p. 6.

storage of 3,120,000 pounds.²⁵

25. Ibid., p. 9.

If we assume pounding is complete by the end of October and that only Maine production is pounded, then the fraction pounded out of the fall

catch is roughly twenty-three per cent.²⁶ This estimate is undoubtedly

26. Assume an annual catch of twenty-one million pounds with two-thirds caught in the July-October period:

$$\begin{array}{r} .66 \times 21 = 13,860,000 \\ \underline{3,120} \\ 13,860 = 22.5 \text{ per cent} \end{array}$$

high since part of the Canadian catch finds its way into American pounds.

This suggests that the marketing of lobsters is essentially a flow mechanism. The net change in the level of stocks, i.e. amount pounded, may be significant but only in the very short run. Whenever there is a significant shift in basic production, the bulk of the change is translated into greater (smaller) market supply. The reasons for this have been enumerated before, i.e. the perishable nature of the product, inadequate storage capacity for many dealers, insufficient working capital to finance inventory, the risk of mortality during storage, etc.

The August peaking of production has another influence which is not as clear as the price effect but which should be pointed out. Years in which the lobsters shed early and in large quantities tend to be associated with better weather and larger catches. However, the lobster year is not a calendar year but a moult year. In those years when the moult is early, the output of the fishery is high at the time of moulting. If the good weather holds into the fall months, the new moult class tends to be well fished out by the end of the calendar year. This implies that the spring and early summer fishery will be smaller in the succeeding calendar year.²⁷

27. The winter fishery being primarily offshore and dealing with largely differentiated populations is less affected.

The following table indicates the magnitude of this carry-over effect in the recent past.

TABLE 4
FLUCTUATIONS IN PRODUCTION
ANNUAL AND MOULT YEAR RESULTS
(millions of pounds)

Annual Data			Moult Year		
Year	Production	% Change from previous year	Period (July-June)	Production	% Change from previous period
1954	21.7	----	1954-55	21.8	----
1955	22.7	4.6	1955-56	22.1	1.4
1956	20.6	9.4	1956-57	21.5	2.7
1957	24.4	18.4	1957-58	24.8	15.3

There is a significant reduction in the amplitude of fluctuations in output when measured on a moult year basis and it would therefore be worth considering reporting the lobster catch on both a moult and calendar year basis.

But regardless of how the catch data may be analyzed, the high concentration of production in the late summer/early fall remains a crucial problem in the fishery. The concentration of output is partly a function of the seasonal catchability of lobsters and the weather. However, it is clear that the welfare of the fishermen and in the long run, of the entire fishery, would be better served if production could be put on a more even flow basis. (The welfare improvement would be based primarily on improved quality of product and lower overhead costs.)

However, it is difficult to see just how this can be accomplished. Clearly, there is no single cure for the summer glut. A number of partial cures might alleviate the situation. Perhaps the most obvious of these are some reasonable restrictions on entry or production or both during the peak months. It is clear that any all out attempt to restrict production during the summer would meet stiff opposition from dealers and fishermen, and as the Canadian

experience indicates, rigid closed seasons create as many problems as they solve.

Throughout a large part of the Maritimes the lobster fishing season is open for only two months of the year, whereas in other areas fishing is permissible for four to six months. Surprisingly enough, however, the most intensive fisheries occur in the short season areas. In such areas the fishery has simply adjusted to the shorter season by employing more men, boats, and gear in order to harvest the crop more quickly. It appears extremely doubtful, therefore, whether closed fishing seasons have any real conservation value for lobsters.²⁸

28. Wilder, op. cit., p. 12.

Another alternative lies in the area of restricting the shedder catch. This might take the form of a limited number of brief closed seasons, i.e. specific areas along the coast, or of a limit on the amount of soft shelled lobsters that could be landed.²⁹

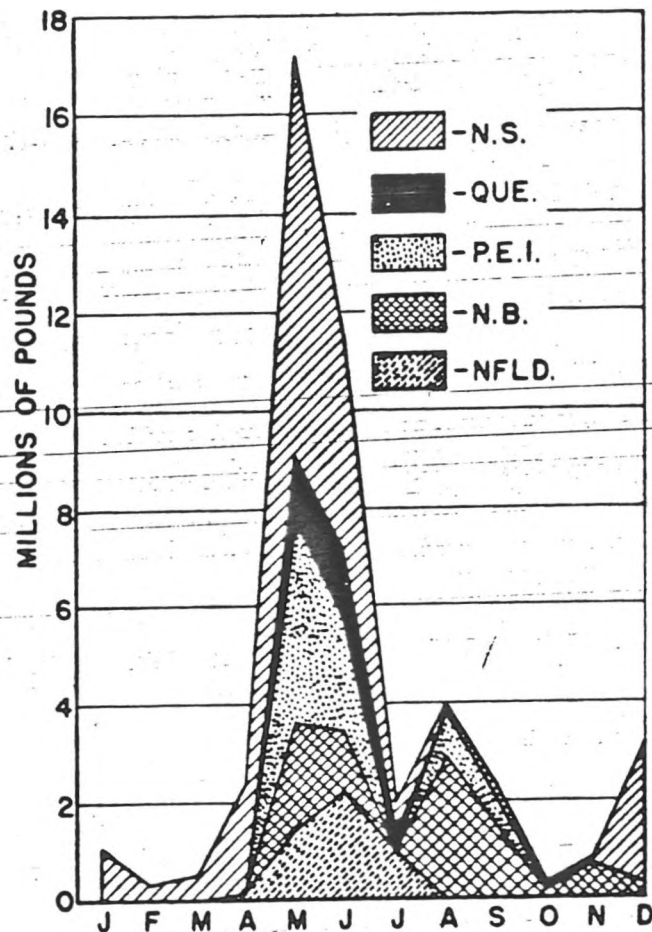
29. The idea of staggering closed seasons along the coast would make greater sense if both Canadian and American production could be coordinated by an international commission.

Chart 10 indicates that the operation of closed seasons in Canada have resulted in a seasonal pattern that is as unfortunate as the one that has arisen under no restrictions in the United States. The closed season has given the Canadian fishery the one advantage of concentrating the catch in the non-shedding period so that, as noted elsewhere, Canadian lobsters command a premium price in New York.

The Canadian seasonal pattern, like the American, also indicates the presence of rapidly diminishing returns for any moult class of lobsters. The closed season starts with very high yields, but these quickly diminish

Chart 10

CANADIAN LANDINGS OF NORTH ATLANTIC LOBSTERS 1953-1956



Lobster Landings - Atlantic Coast
Four-Year Average, 1953-56
(In thousand pounds)

	Nfld.	N. B.	Sub- total	P. E. I.	Sub- total	Que.	Sub- total	N. S.	Total
January	-	71	71	-	71	-	71	1,532	1,603
February	-	11	11	-	11	-	11	356	367
March	-	4	4	-	4	-	4	564	568
April	148	14	162	-	162	-	162	2,244	2,406
May	1,520	2,101	3,621	4,174	7,795	1,335	9,130	8,104	17,234
June	2,215	1,258	3,473	2,366	5,839	1,385	7,224	4,177	11,401
July	1,033	1	1,034	-	1,034	273	1,307	748	2,055
August	-	2,888	2,888	971	3,859	-	3,859	129	3,988
September	-	1,637	1,637	602	2,239	-	2,239	106	2,345
October	-	227	227	50	277	-	277	43	320
November	-	720	720	-	720	-	720	70	790
December	-	313	313	-	313	-	313	4,881	5,194
Total	4,916	9,245	14,161	8,163	22,324	2,993	25,317	22,954	48,271

Source: Trade News, Vol. 9, no. 10, April, 1957, p. 9, published by the Department of Fisheries of Canada

in the presence of an intensive fishery. The Canadian experience also lends support to those who feel that given the level of fishing activity, the same number of lobsters will be caught out of any given moult class regardless of how the fishing season is arranged.

The seasonal peaking of the Canadian catch, although it comes earlier than Maine's, also contributes to a considerable extent to the summer glut. This is due in part to the lag between Canadian landings and the importation of lobsters into the United States. United States imports in July have been about three million pounds and almost two million pounds in the August-September period.

More important, however, is the price effect that may occur in the late spring and early summer. The bulk of Canadian imports, sixty per cent, come in April, May, June, and July. If these imports are coupled with heavy Maine landings, then the seasonal price decline may start earlier than usual. If the early drop in prices is coupled with an August peak in the Maine catch, then a serious loss in revenue may occur in the Maine fishery.

STATISTICAL ANALYSES OF DEMAND AND SUPPLY

This section contains our formal hypotheses about the relationships that exist between the forces, both biological and economic, that influence supply and demand in the lobster fishery. As we point out in Chapter IX, p. 2, to be complete, a model of the fishery must include an analysis of population dynamics. However, this current attempt eschews any such task and what we will present here merely assumes a biological supply condition that is adequate to cover a wide range in the level of demand.

In organizing this section we have followed the usual procedures employed in statistical demand analysis. These procedures, which have been worked out by agricultural economists in particular, theoretically fit all commodities equally well. However, in the lobster fishery there are two problems associated with the use of these techniques which have seriously limited the value of the statistical results obtained. This in no way reduces the desirability of attempting to apply the method. Furthermore, the attempt has served to organize the available data and the relevant variables, and preliminary models have also suggested a number of additional hypotheses which in our opinion should be tested in the future.

The first and most severe limitation on the use of the data is that there is not enough of it. For reasons which we outline below, we felt it necessary to limit the analysis to the post World War II period. This meant only eleven, or in some cases, twelve, observations. In multiple correlation analysis involving as many as five variables, only eleven observations leaves too few degrees of freedom to obtain statistically reliable results.¹

1. For example, the formula for correcting for the size of the sample of the multiple correlation coefficient "R" is:

$$1 - (1 - R^2) \left(\frac{n - 1}{n - m} \right)$$

when "n" is the number of observations and "m" the number of variables.

There were several reasons why we limited our analysis to the post-war period. The argument against extending the analysis over a longer time period was based on our view that the pre-war and post-war fisheries were essentially non-homogeneous, although the reliability of data prior to 1939 was also a consideration. The war period, 1940-1946, was one of rapid transition for the fishery. During the war a number of peculiar circumstances, i.e., especially price controls and rationing, made the fishery subject to a different set of influences than is true ordinarily.

Other data problems were inherent in the statistics. The first of these involved the seasonal distribution of the catch, which as we have noted elsewhere in this chapter, may have a marked effect on the average annual price, i.e. quantity may be the same but price may vary depending on the seasonal pattern. Water temperatures account for some of this fluctuation but by no means all of it. Another deficiency in the data is due to the non-homogeneous nature of the product at certain times of the year. The price of lobsters (usually the period covered is July through September) is a weighted average of the price of hard and soft shelled lobsters. The data of shedding and the proportion of soft shelled lobsters in the catch has an effect on annual price. (This is interrelated with but not exactly the same as the first deficiency noted above.) In fact, there are usually two demand functions facing the primary producer during the peak season of the catch. Unfortunately, as yet there is no

statistical evidence of any kind on the nature of these two functions.²

2. There is no quantitative information on the proportion of shedders in the catch at any given time, nor is there any evidence to indicate whether or not the differential in the price offered the fishermen is statistically relevant to the difference in bodily weight, rate of mortality, number of maimed lobsters, etc.

There are other deficiencies in the data. The data on mean water temperature on an annual basis does not reflect the timing or extent of the warming of the water. The same average annual mean water temperature may be based on quite different seasonal temperature patterns. For example, an exceedingly hot August and September can cancel out a very cold June and July. Acts of nature, such as hurricanes and storms, are not indicated at all in this data. And further, the data is for the surface temperature at Boothbay Harbor which differs from the bottom temperatures, and from the range of bottom temperatures at different depths along the coast.

Finally, the series employed have exhibited similar trends (collinearity) during the period employed, and this effect may give results which appear to be significant but which are due to similar direction of movement rather than to meaningful relationships. (This is partially corrected by including time as a variable.)

Our first step was to provide a schematic representation of the demand and supply relationship (Chart 11). This chart indicates that biological supply and consumer demand are determinate of price. However, the relationship between biological supply and price is seriously modified by other factors which regulate the intensity of fishing activity and the efficiency of the distribution system. A detailed list of the factors which determine these relationships is appended to the chart.

The initial attempt to formulate a statistical demand function for lobsters (Canadian) was by H. Scott Gordon. The results of his attempt were statistically negative, and while our results are consistent with his, we do not agree with the conclusion he reached; namely, that catch fluctuations result primarily from fluctuations in biological populations.³

SHORT-RUN DETERMINATION OF

SUPPLY

AND

DEMAND

BIOLOGICAL
SUPPLY

CONSUMER
DEMAND

LOBSTER
CATCH

STORAGE AND
DISTRIBUTION
SYSTEM

MARKET
PRICE

FISHING INTENSITY

WATER TEMPERATURE

WEATHER

MARINE
ENVIRONMENT

RETURNS TO
THE FACTOR
INPUTS

EFFORT

RETURN

FUNCTIONAL RELATIONSHIPS IMPLIED IN FLOW CHART

A Partial List of Influences on the Supply of and the Demand for Maine Lobsters

Supply

I. Biological supply

1. The state of the current population (especially age and size distribution)
2. Food supply
3. Predation and mortality from sources other than man at all stages
4. Rate of reproduction and growth

II. Lobster catch

1. Legal size restriction
 - a. Effect of size limits on conservation
 - b. Relationship of size limits to the degree of catchability of various sizes of lobsters
2. Fishing environment
 - a. Weather conditions; number of days fishing is possible inshore and offshore; loss from storms
 - b. Water temperature; critical temperature limits; effect of temperature on the rate of activity (catchability), growth, and time of moulting
3. Fishing intensity
 - a. Number of fishermen
 - b. Amount of capital equipment employed and its rate of utilization
 - c. Adequacy of the relationship of earnings to current costs to provide for motivation of existing fishermen and an incentive for entry
 - d. Limiting factors; availability of bait, design of equipment

III. Storage and Distribution System

1. Workability of the structure of distribution
 - a. Number and size of dealer firms
 - b. Financial capabilities
 - c. Level of entrepreneurial skills
2. Amount and distribution of storage facilities
3. Efficiency of the marketing system
 - a. The scope of the distribution system
 - b. Sales promotion efforts

IV. Consumer Demand

1. Consumer income
2. Tastes
3. Availability of supply in specific markets

In these three cases (Atlantic lobster, Pacific salmon, Pacific halibut), the statistical results appear to be clearly negative. No significant correlation exists between catch and economic factors. This is as might be expected. Atlantic lobster and Pacific salmon are known to be exploited very intensively and one would expect that catch fluctuations would be dominated by changes in the magnitude of the stocks. Pacific halibut has been under strict quota regulation and hence no opportunity has been allowed for landings to respond to economic factors during the period studied.

3. H. Scott Gordon, "Economic Factors in Catch Fluctuations" from Journal of the Fisheries Research Board of Canada, January, 1955, Volume XIII, No. 1, p. 92.

Gordon used the standard method of correlation analysis with the following variables: X_1 annual catch; X_2 consumer expenditures; X_3 average annual price. His data covered the period 1926-1950, and the variables X_2 and X_3 were adjusted by a consumer price index.

The variables we used in constructing the demand equation are of the order usually employed in this type of problem.⁴

4. Our variables are the same as H. Scott Gordon's except that we have added total landings and time and on the supply side, water temperature.

The results of the simple linear (bivariate) correlations between the variables are given in Table 6. In all cases the unexplained variance is high (except where variables are correlated with time or the Maine catch is related to total supply).

A statistical demand function was then derived from the indicated variables by the standard multiple correlation techniques:

$$X_1 = 88.57X_2 - 73.29X_3 + 0.67X_4 - 645.38X_5 - 26,838.39$$

where

X_1 = Maine landings in thousands of pounds

X_2 = U.S. personal consumption expenditures on goods and services in dollars (adjusted by Consumer Price Index, 1947-49 = 100)

X_3 = Average annual price paid to lobstermen for Maine lobsters in cents (adjusted by Consumer Price Index, 1947-49 = 100)

X_4 = Total U.S. landings of lobsters plus Canadian imports (not canned) in thousands of pounds

X_5 = Time, measured in one year units, mid-1952 center

The standard error for each coefficient was computed and is given in Table 7. The magnitude of these standard errors indicates that except for X_4 , the relationship between Maine and the combined total market supply (i.e., United States output and live Canadian imports) that none of the coefficients is significant. This is also reflected in the low values in the partial correlation coefficients given in the same table.

However, the overall equation has a coefficient of correlation of $(R_{1.2345}) = .97$ and a coefficient of determination of $(R^2_{1.2345}) = .94$. This correlation result, which is high, especially in view of the limitations we have discussed, is due to the close relationship between the Maine catch and total supply.

A more systematic review of the contribution of each variable to the overall coefficient gives the following results:

If we start with our most significant result, the relationship between Maine landings and total supply, our equation would be as follows:

$$(2) \quad X_1 = 0.67X_4 - 11,794.9$$

This equation has a coefficient of correlation of $r_{14} = .96$ and a coefficient of determination of $r^2_{14} = .91$ (compared with $R_{1.2345} = .97$ and $R^2_{1.2345} = .94$). Table 9 indicates the results when predicted values based on this equation are compared with actual results. The per cent of error in prediction is relatively low. This is because the amount of

TABLE 5

STATISTICS USED IN DETERMINATION OF DEMAND EQUATION

Year	X_1	X_2	X_3	X_4	X_5
1947	18,277	173.3	39.17	42,326	-5
1948	15,923	172.8	39.34	41,835	-4
1949	19,273	177.4	34.14	46,017	-3
1950	18,353	188.7	33.99	45,240	-2
1951	20,759	187.7	31.31	49,501	-1
1952	20,036	192.3	37.43	48,226	0
1953	22,300	201.5	32.97	50,713	1
1954	21,668	206.1	32.51	49,936	2
1955	22,718	222.2	33.51	51,901	3
1956	20,572	229.9	38.15	48,995	4
1957	24,403	233.3	30.52	52,370	5

Sources and descriptions of above statistics:

X_1 = Total annual landings at Maine ports in thousands of pounds. Data from various issues of Maine Landings published by the Department of the Interior, Fish and Wildlife Service in cooperation with the Department of Sea and Shore Fisheries, Augusta, Maine

X_2 = Total U.S. personal consumption expenditures in dollars adjusted by the U.S. Department of Labor Consumer Price Index (1947-49 = 100). Data from various publications of U.S. Department of Commerce

X_3 = Average annual price of Maine lobsters in cents adjusted by the U.S. Department of Labor Consumer Price Index (1947-49 = 100). Data from Maine Landings cited above. Data (unadjusted) computed by dividing total landed value by total landed pounds for the given year

X_4 = Total U.S. catch plus Canadian imports (not canned) in thousands of pounds. Data from various publications of the Fish and Wildlife Service, Department of the Interior

X_5 = Time in yearly units measured from mid-1952

TABLE 6

COEFFICIENTS OF CORRELATION

Simple Linear Case

n = 11

1947-1957

	Coefficient of Correlation "r"	Coefficient of Determination "r ² "
1. Maine Landings (personal consumption adjusted)	.81	.66
2. Maine Landings (average price adjusted)	-.73	.54
3. Maine Landings (total landings)	.96	.91
4. Maine Landings (time)	.86	.73
5. Personal consumption adjusted (average price adjusted)	-.41	.16
6. Personal consumption adjusted (total landings)	.82	.68
7. Personal consumption adjusted (time)	.98	.96
8. Average price (total landings)	-.73	.54
9. Average price (time)	-.49	.24
10. Total landings and time	.89	.80

"r" as used in the text and tables that follow is the Pearsonian coefficient of correlation. A pure number which expresses the relationship between two variables, "r" has units of - and +1

"r²" the coefficient of determination, indicates how much of the relationship is explained. If the relationship between X_1 and X_2 is .9, r^2 is then .81. This says that 81 per cent of the variation in X_1 is explained by the presence of X_2 and 19 per cent ($100 - 81 = 19$) is unexplained, i.e., due to the presence of some variable not identified in the problem. $R_{1.23}$ is similar to the value "r" except that the problem now includes three or more variables. $r_{12.3}^2$ shows the relationship between X_1 and X_2 with the variable X_3 present but held constant

Table 7

<u>Regression Coefficient</u>	<u>Value of Coefficient</u>	<u>Standard Error of Regression Coefficient</u>	<u>Coefficient of Correlation</u>
$b_{12.345}$	88.6	62.9	$r_{12.345} = .50$
$b_{13.245}$	-73.3	136.6	$r_{13.245} = -.21$
$b_{14.235}$.7	.3	$r_{14.235} = .73$
$b_{15.234}$	645.4	546.0	$r_{15.234} = -.43$

Table 8

THE DEMAND EQUATION

Partial Coefficients of Correlation Holding Time Constant

11 Observations

(1947-1957)

Between	r	r ²
No. Catch and Personal Consumption	r _{12.5} 0.21480	0.04611
No. Catch and Price (Adjusted)	r _{13.5} -0.70093	0.49130
No. Catch and U. S. and Can. Imports	r _{14.5} 0.82033	0.67294
U. S. Consumption and Price	r _{23.5} -0.39295	0.15441
Consumption and U. S. Catch and Imports	r _{24.5} 0.55016	0.30268
Price and U. S. Catch and Imports	r _{34.5} -0.76003	0.57773
No. Catch, Consumption and U. S. and Canadian	r _{1(23).5} 0.86800	0.75343
No. Catch, Consumption and Price	r _{1(24).5} 0.73766	0.54414
No. Catch, Price and Total U. S. and Canadian Imports	r _{1(34).5} 0.82593	0.68712
No. Catch, Consumption, Price, and Live Market Total	r _{1(234).5} 0.87454	0.76481

Table 9
ACTUAL AND PREDICTED LOBSTER CATCH
FROM DEMAND EQUATION (2)

Year	Me. Landings Actual	Predicted Landings X_1	Error	% Error
1947	18,277	17,300	-977	-5.3%
1948	15,923	16,268	+345	+2.2%
1949	19,273	19,220	- 53	-0.3%
1950	18,353	19,065	+712	+3.9%
1951	20,759	21,389	+630	+3.0%
1952	20,036	19,389	-189	-0.9%
1953	22,300	22,013	-287	-1.3%
1954	21,668	21,287	-381	-1.8%
1955	22,718	23,314	+596	+2.6%
1956	20,572	21,059	+487	+2.4%
1957	24,403	23,541	-862	-3.5%

Table 10

Coefficient of Correlation	Coefficient of Determination	Variables
$r_{14} = 0.95529$	$r_{14}^2 = 0.91258$	Me. Catch and Live Market U. S. (total supply)
$R_{1.45} = 0.95531$	$R_{1.45}^2 = 0.91260$	Adding Time
$R_{1.245} = 0.96649$	$R_{1.245}^2 = 0.93411$	Adding Consumption Expenditures
$R_{1.2345} = 0.96807$	$R_{1.2345}^2 = 0.93715$	Adding Price

Partial Coefficients Related to the Above

$r_{15.4} = 0.01183$	$r_{15.4}^2 = 0.00014$
$r_{12.45} = 0.48112$	$r_{12.45}^2 = 0.23148$
$r_{13.245} = 0.21400$	$r_{13.245}^2 = 0.04580$

Canadian live imports has been reasonably constant so that fluctuations in the combined total output are due primarily to fluctuations in the Maine catch.

If we attempt to improve on this basic relationship by adding economic variables, i.e. consumption and price, as Table indicates, we gain very little.

The failure of the addition of economic variables to add anything significant leaves us with the same statistical result as H. Scott Gordon. However, as we noted above, this does not rule out the possibility of an existence of a significant relationship between economic factors and the demand for lobsters. The presence of this type of relationship is suggested by the significant relationship $r^2_{13.5} = .49$ between Maine production and price as well as the results in the simple bivariate case which suggest significant relationships between Maine landings and price and Maine landings and consumption.

It still appears likely that more data, the use of lagged relationships, and additional variables would make it possible to construct a significant demand equation.

THE SUPPLY FUNCTION

The method of construction of the supply function and its analysis is symmetrical with what we have presented for the demand function. The supply function is differentiated from the demand function in that it excludes X_2 (personal consumption) and X_4 (total catch) and it includes X_6 (yearly mean water temperature). Water temperature stands not only for the temperature catch relationship but also for a measure, indirect to be sure, of the intensity of fishing effort. Temperature is a rough guide to intensity because higher average temperatures imply better weather and good fishing conditions. This assumption, however, is only true in the short run and temperature is an inadequate measure of the intensity of fishing if the level of output is changing rapidly.

The statistics used in calculating the supply equation are given below in Table .

The simple bivariate correlations are, as indicated, not indicative of close significant relationships between the variables. Particularly disappointing are the coefficients of determination for the relationship between landings and price and landings and water temperature.

Multiple correlation techniques yield the regression equation for the supply of lobsters for the period 1947-1958:

$$(3) \quad X_1 = - 211.66X_3 + 477.66X_5 + 337.84X_6 + 10,977.22$$

The correlation coefficient derived from this equation is $R_{1.356} = .94$ and the coefficient of determination is $R_{1.346}^2 = .89$. Unbiased estimates of the standard errors of the coefficients of regression were also computed and are given in Table 13.

TABLE 11

STATISTICS USED IN DETERMINATION OF SUPPLY EQUATION

Year	X ₁	X ₃	X ₆	X ₅	U.S. Dept. of Labor Consumer Price Index
1947	18,277	39.17	48.5	-5	95.2
1948	15,923	39.34	46.7	-4	102.8
1949	19,273	34.14	50.1	-3	101.8
1950	18,353	33.99	49.6	-2	102.8
1951	20,759	31.31	51.5	-1	111.0
1952	20,036	37.43	50.1	0	113.5
1953	22,300	32.97	51.9	1	114.4
1954	21,668	32.51	50.2	2	114.8
1955	22,718	33.51	50.1	3	114.5
1956	20,572	38.15	48.5	4	116.2
1957	24,403	30.52	48.9	5	120.2
1958	21,312	39.68	47.3	6	123.5

Sources and descriptions of above statistics:

X₁ = Total annual landings at Maine ports in thousands of pounds. Data from various issues of Maine Landings published by the Department of the Interior, Fish and Wildlife Service in cooperation with the Department of Sea and Shore Fisheries, Augusta, Maine

X₃ = Average annual price of Maine lobsters in cents adjusted by the U.S. Department of Labor Consumer Price Index (1947-49 = 100). Data from Maine Landings cited above. Data (unadjusted) computed by dividing total landed value by total landed pounds for the given year

X₆ = Mean yearly water temperature (Fahrenheit) at Boothbay Harbor. Data supplied by Fish and Wildlife Service. U.S. Fishery Laboratory at Boothbay Harbor

X₅ = Time in yearly units measured from mid-1952

U.S. Department of Labor Consumer Price Index (1947-49 = 100) taken from publications of the U.S. Department of Commerce

TABLE 12

CORRELATION COEFFICIENTS

Simple Bivariate Case

r = 12 1947 - 1958

	r	r ²
Maine landings - average price (adjusted)	-.61	.37
Maine landings - mean water temperature	.43	.18
Maine landings - time	.80	.64
Average price (adjusted) - time	.19	.03
Average price (adjusted) - mean water temperature	.72	.53
Mean water temperature - time	.03	.00

TABLE 13

Regression Coefficient	Value	Standard Error	Coefficient of Correlation
$r_{13.56}$	-211.66	124.4	-.52
$r_{15.36}$	477.66	146.7	.91
$r_{16.35}$	337.84	262.5	.41

As was true in our demand equation, only one coefficient is statistically significant, the one which relates catch and time. If we equate all the coefficients in (3) to zero except that of X_5 , we reduce equation (3) to the following:

$$(4) \quad X_1 = 477.66X_5 - 20,227.56$$

The coefficient of correlation for this equation, as given in the table of bivariate, is $r_{15} = .80$ and the coefficient of determination is $r^2_{15} = .64$.

In the supply case there is a greater gain from adding variables than was true in the equation where almost all of the value of the correlation coefficient was determined by one relationship. The addition of temperature and price yields a net determination of .69 ($r_{1(36).5} = .69$, i.e., 69 per cent of the unexplained variance of $(100 - 64 = .36)$ is accounted for by the additional variables that was not explained by the simple bivariate relationship between catch and time.)

On a step by step basis the following results were obtained starting from $r_{15} = .80$ and $r^2_{15} = .64$ adding price as a variable we have $R_{1.35} = .89$ and $R^2_{1.35} = .80$. The further addition of water temperature gives the values for equation (3):

$$R_{1.356} = .94 \text{ and } R^2_{1.356} = .89$$

However, as was true in the demand case the absence of statistical significance in the regression coefficients casts serious doubts on the validity of the results.¹

1. The partial coefficients of correlation, holding time constant, were also computed.

		r	r ²
Catch and Price	$r_{13.5}$	-.79	.62
Catch and Water Temperature	$r_{16.5}$.67	.44
Catch, Price and Temperature	$r_{136.5}$.83	.69

THE WATER TEMPERATURE HYPOTHESIS

We have referred on several occasions to the relationship between temperature and catch and we have included water temperature (near surface temperature at Boothbay Harbor) as a variable in our supply equation. We have also indicated our dissatisfaction with previous work on this hypothesis. This is not the place for a complete review of the issues involved in this suggestive relationship; however, in the course of experimenting with a number of temperature-catch relationships, we have found one that is both reasonable and statistically significant. Since this may become eventually an important aspect of the determination of lobster supply, we include it at this point.¹

1. We plan in the future to undertake a systematic review of the temperature-catch relationship.

The relationship which we found to be significant was between the percentage of the yearly catch landed in the months of March through August and the mean Boothbay Harbor water temperature for the year. This relationship is given in Chart 12.

This is essentially a relationship between the seasonal pattern and temperature. It is more restricted than previous hypotheses in that it does not assert anything directly about the level of output. This relationship deals solely with the distribution of output and from this distribution pattern further deductions may be made about price and future output effects.

Based on all observations in the period 1939 to 1958, we find a value

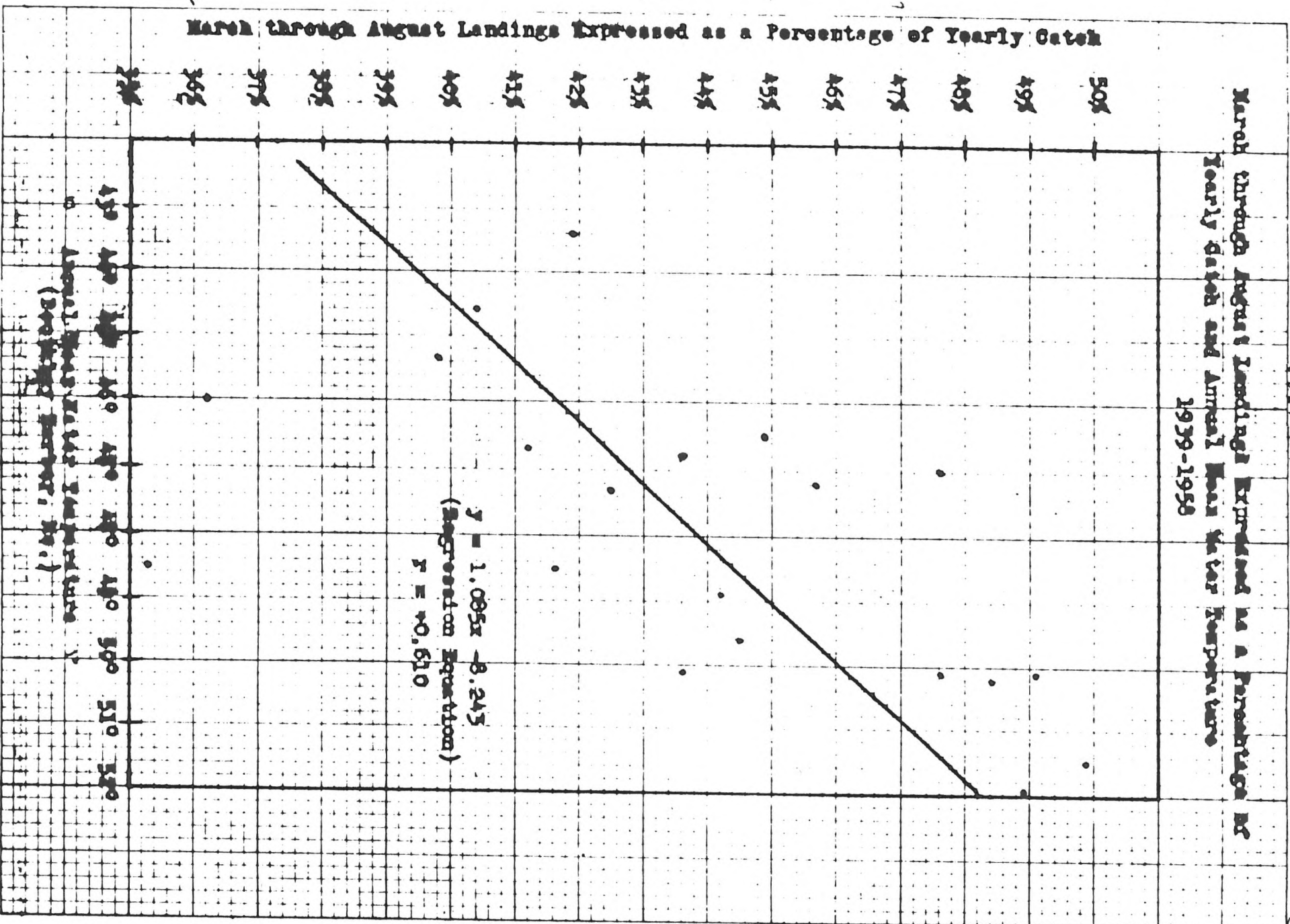
TABLE 14

March through August Landings as a Percent of Total Annual
Landings and Average Annual Mean Water Temperature
At Boothbay Harbor, Maine, 1939-1958

Year	Percent of Catch Landed Mar.-Aug.	Annual Mean Water Temp.
1939	41.9%	43.40 F.
1940	40.4%	44.60 F.
1941	36.2%	45.00 F.
1942	43.6%	46.60 F.
1943	39.8%	45.30 F.
1944	44.9%	46.50 F.
1945	47.6%	47.00 F.
1946	45.7%	47.20 F.
1947	41.6%	48.50 F.
1948	41.2%	46.70 F.
1949	43.6%	50.10 F.
1950	44.5%	49.60 F.
1951	40.9%	51.50 F.
1952	49.1%	50.10 F.
1953	48.9%	51.90 F.
1954	48.4%	50.20 F.
1955	47.6%	50.10 F.
1956	35.3%	48.50 F.
1957	44.2%	48.90 F.
1958	42.5%	47.30 F.

March through August Landings Expressed as a Percentage of Yearly Catch

March through August Landings Expressed as a Percentage of
Yearly catch and Annual Mean Water Temperature
1939-1958



of $r = .61$ which is significant at a 1 per cent level. If we refine our data by removing the period 1939-1946, we obtain $r = .74$, which is also significant. The justification for this refinement has been offered before and is basically that the war and pre-war fisheries are not homogeneous with the post-war fishery. If we also removed 1956 from the remaining series, we find $r = .86$ and $r^2 = .74$. 1956 is peculiar in that the catch in October was almost as high as the September peak.

This relationship says that if temperatures are low in a given year, the landings will be relatively low in the six-month period from March through August, i.e. the remaining six months will have a higher relative share of the catch than they will have if temperatures are high. This assumes that most of each moult class will be caught, and the correlation results indicate that temperature dictates to some extent when it will be caught.

Lower water temperatures are, therefore, indirectly associated with higher prices and vice versa. As we noted in our discussion of the seasonal pattern, if the price is forced down early in the season, then it tends to stay depressed throughout the summer and fall. In this manner temperature and its concomitant side effects seem to influence the level of earnings in the fishery in the short run.

THE ECONOMIC THEORY OF THE LOBSTER FISHERY

This chapter is an attempt to integrate the specific economics of lobstering with some recent developments in the economic theory of fisheries. The principal theoretical papers in economics are:¹

1. 1) H. Scott Gordon, "The Economic Theory of a Common Property Resource: The Fishery," Journal of Political Economy (April, 1954). H. Scott Gordon, "The Economic Approach to the Optimum Utilization of Fishing Resources," Journal of the Fisheries Research Board of Canada (September, 1953).

2) Anthony Scott, "The Fishery: The Objectives of Sole Ownership," Journal of Political Economy (April, 1955).

3) Milner B. Schaefer, "Some Considerations of Population Dynamics and Economics in Relation to the Management of the Commercial Fisheries," Journal of the Fisheries Research Board of Canada (September, 1957).

4) The papers in a symposium conducted by the FAO, The Economics of Fisheries, R. Turvey, Ed., FAO (1957).

More specifically, this chapter is a theoretical analysis of the nature of supply in the fisheries, and also includes a discussion of the impact of supply conditions on the welfare of the fishery. The crucial economic and biological question is, of course, what is the optimum rate of withdrawal of the stock of any marine species. However, it is impossible here to discuss adequately, if we could, the complex question of biological population dynamics. We may only suggest that knowledge in this field is in a state of flux and that commonly accepted notions of "good conservation policies" are rapidly changing.²

2. For example, see Lionel A. Walford, Living Resources of the Sea (New York: Ronald Press, 1958).

More specifically, the biological problem is how to get the optimum metabolic performance from a given species that includes man among its predators. However, this optimum is not easily defined. Is it in terms of a population that has an age distribution that includes many older and larger individuals or a population of younger more rapidly growing individuals or some other alternative? The answer to this question is as yet, given the complexity of marine environments, not determinable. For many marine species with their fantastic reproduction rates predation by man may play a very minor role, the size and type of population being dependent primarily on environmental conditions, i.e. food supply, predation in the larval stages, etc. For example, if the average female lobster carries in excess of 15,000 eggs of which only half a dozen survive to adulthood four or more years later, it is obvious that many more lobster dinners are enjoyed by other predators, including older lobsters, than by man. The case is even more striking for other species. The adult female codfish may lay several million (or more) eggs at each spawning; however, man may be the principal predator on the adult populations.

Finally, to be meaningful, biological population dynamics (supply) must be considered in conjunction with the economics of the fishery. And here one must decide on a suitable time horizon for the exploitation of a given fish resource in a given state of technology. The aim of the fishery is human subsistence and the improvement of economic welfare, not the preservation of any kind of fish.³ Therefore, given costs and techniques of fishing

3. Popular belief persists that some "good", largely of a conservation nature, will accrue from the "saving" of even biologically undesirable members of a population; i.e. the preservation of venerable lobsters is "good conservation" because they are not being utilized commercially.

suggest that the long run optimum yield may involve running down the stock of a certain species, i.e. the fish population should be reduced to the point of marginal return for the effort expended.

We have emphasized the complexities of the biological environment and of the interaction of the biological and economic theory, merely to point up the extremely tentative nature of our economic conclusions. A great deal more must be learned about the extent and nature of the supply of any marine resource before a useful model of maximum utilization based on both cost and supply considerations can be constructed.⁴

4. This should not be taken to mean that if we had all the biological information we would wish for that the fisheries of the world could then be exploited rationally. Institutional barriers that vary from the habits and superstitions of fishermen to international agreements are also very important real blocks.

If we cannot, as yet, deal effectively with a general theory of a fishery, we can examine the state of economic theory and see what light it will shed on at least a partial area of the theory of fisheries.

The current status of economic thinking centers on the common property hypothesis. It is asserted that the exploitation of a given resource will yield a smaller average return to the exploiters if no one owns the resource than if the resource is owned as is any other piece of private property.⁵

5. The technical economic argument runs as follows: In a purely competitive model all firms are usually assumed to have homogeneous cost curves. The long run equilibrium solution for the industry is when price equals average cost equals marginal cost for all producers.

If the assumption of homogeneous cost curves is relaxed to allow for (say in the case of agriculture, different productivity of different pieces of land) difference in the productivity of the fixed factor, then some firms will find themselves in a position where the going price is greater than their minimum average cost. The firm in this position will extend output

to where marginal cost is equal to price and so the industry will continue to price on a marginal cost basis. However, because it can restrict entry, i.e. it owns the more productive fixed factor, the advantageously located firm will earn intramarginal rent to the extent that price exceeds average cost.

In the case of the fishery that more productive fixed factor, i.e. a specific fishing ground, is not owned and therefore the intramarginal rent it generates attracts entry. The effect of entry in the more productive area will be to increase costs. Costs will creep up until all producers in all fishing grounds are operating as marginal producers on marginal fishing grounds. In effect this is an actual case of homogeneous cost functions caused by unrestricted access to the differential rents that might accrue if the different areas were owned by individuals or firms. And theoretically, since all producers are equating price, average cost and marginal cost, each firm is earning a normal return, i.e. a purely competitive case is realized.

It is not a clear "a priori" what the effect of entry will be on output and therefore industry price and the long-run equilibrium solution.

In some instances, entry may cause an extension, geographically, time-wise, and in terms of intensity of effort and therefore increase output. This is a partial explanation of the increase in output in the Maine lobster fishery from 1940 to 1947. However, in certain cases, i.e. the Sebasco area (see Chapter) the population curves are so badly skewed, "J" shaped, that it does not appear likely output could expand without autonomous biological changes in supply, i.e. the catch each year consists almost exclusively of the moult class that comes into the legal size range so that for each moult year returns literally diminish toward zero.

While the common property hypothesis may have some affect, the basic cause of poverty among fishermen is still to be found in low productivity and the impact of monopsony and oligopsony.

An underlying assumption of this analysis is that the theoretical comparison between returns to owned and unowned resources is carried on in a context of pure competition.⁶

6. A discussion of the welfare implications of the purely competitive firm and industry may be found in any textbook on economic theory. An excellent treatment which thoroughly describes the welfare norms and structural limitations of the competitive model is in Joe S. Bain, Pricing, Distribution and Employment, (Revised Edition; New York: Henry Holt & Co., 1953).

Competitive industries usually have well documented histories of operational difficulties. There are a wide variety of reasons for these problems. Factor immobility is perhaps the most important cause of excess

capacity, with resulting low wages and inadequate return to capital, although lack of financial strength, weak management, no funds for research, the nature of the product, the impact of oligopolistic or non-competitive industries on the competitive industry, etc. all contribute to a poor performance.

Of all possible industrial comparisons, the fisheries are most analogous to agriculture. Agriculture is ordinarily classified by economists as an increasing cost industry, i.e. an industry where the per unit cost of production increases as output expands. In the usual case increasing cost results from the operation of variable proportions, i.e. the application of increasing amounts of a variable factor, input (labor), against a fixed factor (land, capital). Returns from additional units of labor input will at first increase and then subsequently decline (costs will move inversely, first falling, then rising). This is the traditional Ricardian case of increasing cost (diminishing returns). There are some slight differences between the fisheries and the typical Ricardian case. Increasing costs in fisheries are partly due to diminishing returns. (This is probably especially true of the lobster fishery with its catch size limit and relatively discrete populations into which a new moult class is projected each year.⁷

7. Also important is the high catchability of the post-moult lobster and the impact of water temperature (seasonal variations) on foraging and catchability.

External economies and the pattern of resource use over time are also factors that may cause increasing costs. However, the differences cited are relatively minor and for all practical purposes the fisheries may be considered to be the same as agriculture in their tendency for costs to rise with increased

intensity of fishing. These industries are similar, therefore, except that in the case of the fisheries, the basic resource - the collection of banks, reefs, etc. - that make up the fishing grounds is available to all comers. In agriculture the productivity of different land areas varies considerably. Each farmer as the owner of a particular piece of land plants and harvests his crop. The price he receives for his crop is set by supply and demand conditions in the market, and is the same for all farmers. However, farm incomes, the return to each farmer, will vary based in part on the relative productivity of the various pieces of land cultivated. The plots of greater productivity earn what are called intramarginal rents.⁸

8. If all plots of land were the same size and had the same labor and capital input some would yield greater output than others.

In the fisheries these intramarginal rents tend to be eliminated even though different fishing grounds have different productivities. Where there is a competitive industrial structure but no one owns the resource, each producer is free to exploit the most productive grounds. The result is that many producers will move to exploit the most productive grounds first. However, the returns to each producer will be reduced since too many are attempting to use the same ground. The ultimate result of this competitive withdrawal will be to reduce the returns to each fisherman to that available at the margin, i.e. to the point that the return to each fisherman on what was the most productive ground is equal to the return to the fisherman on the least productive ground.⁹

9. In the lobster fishery the most productive grounds are perhaps those which are the most consistently inaccessible.

In this situation with all producers operating at the margin there are more fishermen (and capital) in the fishery than there would be if the fishery were owned. In this situation no fisherman earns any intramarginal rent, although the aggregate return to the fishery is approximately the same as if the fishing grounds had been privately owned.¹⁰

10. Based on the assumption that productivity is non-variable and cannot be influenced by man.

It is impossible to say "a priori" how much rent is lost by fishermen in this fashion, but whatever the amount, it serves to accentuate the difficulties of a competitive industry operating in a world of less than perfect competition. It is harder than usual for individuals and firms to achieve the financial strength needed for stability and specialization and the exploitation of any cost advantages that might accrue to larger organizations. At the same time the low rate of profit makes money capital difficult to obtain.

However, the analysis of the elimination of rent in the fisheries needs some modification. There is an element of luck, of gambling, in all fishing. Fishermen, like prospectors, are always hoping for the "big catch." Since "big catches" do occur, these represent a rental income to the fortunate fishermen. However, the lucky catches may be distributed randomly among the individuals and firms in the fishery and what is more important they are not consistent enough to provide greater financial strength and stability.¹¹

11. The more competent fishermen are looked upon with grudging respect by the less competent for their ability to make big catches with more than random consistency; i.e. the two hundred trap fisherman who catches as many lobsters as his three hundred trap competitor.

The evaluation of the loss of rents is difficult, but in all probability equally important is the nature of the buyer's market that any fishery faces. Great pressures may be exerted by monopsonistic (a monopolist who is a buyer, not a seller) and oligopsonistic buyers and these market forces may outweigh the loss of rents in any given fishery.

At this point we may ask how, in what way, does this general model of a competitive industry without intramarginal rent fit the specifics of the Maine lobster fishery. First of all, it does not appear that the productivity ladder, i.e. the difference in productivity in different fishing grounds is very great. Therefore, the intramarginal rent lost is an important but not a crucial factor in the welfare of this fishery.¹²

12. Biologists have suggested that along the Maine coast from Small Point (the eastern edge of Casco Bay) to Cutler is roughly an equally productive fishing area. West of Small Point productivity drops due to increasingly sandy bottoms while east of Cutler lower water temperature and a less favorable conformation of the coast affect the catch.

Rents in the form of "lucky catches" have been seriously affected by the changing technology of the fishery. The increased use of the fathometer has enabled the fisherman to locate the hidden ledge with its dense lobster population. However, the fishery is so intense that new highly productive areas do not go unnoticed for long, and the initial advantage is soon lost. The impact of competition on productivity differences is less the further offshore the new grounds are located, so that there is probably some net gain to individuals from productivity differentials.

There is also considerable difference in the productivity of individual fishermen. Personal income is a function of hours worked, attention paid to gear and equipment, careful observation of ocean conditions, and the

general level of personal organization and competence.¹³

13. There is some resemblance to private property in the lobster fishery in the form of traditional family fishing rights. These are, of course, extra-legal.

The crucial condition in the determination of the lobsterman's income is the ease of entry in the fishery. Entry is possible for less than \$100 capital investment. This will cover the cost of a row boat, possibly including a second hand outboard motor, a few traps, and a license. Equipment of this kind is sufficient for a summer fisherman who works inshore, i.e. in the bays and coves. Entry of this type is a significant factor in the fishery.¹⁴

14. The phrase "equipment of this kind" is used here to cover all inshore summer fishermen, some of whom may use quite extensive equipment. The number and age of part-time fishermen is discussed in Chapter III.

Since there are apparently no great economies of scale in the fishery, entry is profitable for part-time fishermen. Perhaps the greatest damage of the ease of entry is in terms of its seasonal concentration. The summer peak of production is certainly the greatest problem facing the producers. Easy entry contributes to this summer glut and accentuates the price decline in the July-September period with an adverse effect on annual earnings of the fishermen as contrasted with summer monthly earnings. This latter point, of course, prevents effective collective action by the fishermen. The Maine Lobsterman's Association had great difficulty in "tying up" the coast in the summer of 1957 at the time fishermen were making their highest monthly gross earnings of the year.¹⁵

15. This argument rests on the assumption that in any given year the same number of lobsters will be caught regardless of whether they are caught in July, August, September or in other months.

Closed seasons have not worked well in fisheries except in special circumstances, and therefore it is with great hesitancy that we even raise the issue. However, it might be a worthwhile experiment to close the coast for all or a part of the summer season.¹⁶

16. The institutional barriers to this suggestion are, of course, very large, i.e. the fishermen themselves and especially the dealers who buy at the summer price to stock their pounds. One reason the price rose to its highest point ever in the spring of 1959 was that the colder summer of 1958 and introduction of the larger size measure reduced the catch in July, August, and September of 1958. The increase in the minimum size probably excluded from the catch about ten per cent by number and eight to nine per cent by weight. On the basis of a six million pound catch in July and August, this amounted to one-half million pounds. As a result the price stayed around fifty cents a pound all summer, and there was much less "pounding" than usual. The dealers, being reluctant to stock inventory at that price, regretted this action when the price was over \$1.50 a pound in the spring of 1959.

Short of closing the season, other "reasonable" barriers to entry (for instance, higher license fees or a monthly summer quota) might help even out the seasonal variations somewhat and partially protect the full-time fisherman from the impact of today's undue ease of entry.¹⁷

17. A monthly summer quota, of course, would present various administrative problems.

Economies of scale which might create some barriers to entry are apparently unimportant in the lobster fishery. There is no advantage and there is a cost disadvantage in using boats larger than about forty feet.

Traps must all be pulled individually, except for trawl set traps, and one boat can only economically pull, bait, and lower so many traps a day.¹⁸

18. The question of the optimum size for a boat is complex, i.e. the winter offshore fishery should use boats 60 to 65 feet using two-men crews. Boats this size, however, are awkward and expensive in the inshore fishery in the summer.

Further investment in warp (rope) and the possibility of loss prevent the extension of the fishery to too great a depth. The loss of traps is large during storms. Some fishermen estimate that they lose twenty-five per cent per year.¹⁹

19. Dragging may be carried on at greater depths, but to be successful must be carried on in areas of high population density, and on the type of bottom preferred by lobsters. Furthermore, dragging involves high operating costs and it creates its own storage and handling problems.

So it would appear that the fishery will remain an individual operation.²⁰

20. The cost of rearing lobsters is also prohibitive.

With all these factors mitigating against the lobster fisherman, he (the competent full-time fisherman) remains reasonably well off. In part the replacement of capital in this industry has taken place via a lower, or at least a different, standard of living for the fisherman. The geographic isolation, the history of taste, the social differentiation, have meant in the past a greater willingness to accept substandard housing, medical care, etc.

However, reduced consumption is only part of the explanation of the

ability to replace capital. The inelastic nature of demand for a significant portion of the catch has in recent years resulted in reasonable annual earnings for the full-time fishermen. However, the earnings of the fishermen do not approach what they might be if the fishery were exploited more rationally and the product was better marketed. It is the innate feeling of this great disparity between what is and what could be that troubles the coastal people.